

**CLOSED SANITATION, INC. LANDFILL
LEWISTOWN, MONTANA
GROUNDWATER SAMPLING AND ANALYSIS PLAN**

Prepared for:
Barry Damschen Consulting, LLC

Prepared by:
Hydrometrics, Inc.
Consulting Scientists & Engineers 
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Helena, MT 59601

November 2007

RECEIVED

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September 3, 2009

Mr. Martin van Oort
Environmental Science Specialist
Solid Waste Section
Montana Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901

RE: Closed Sanitation, Inc. Landfill, Lewistown, Montana
Revised Groundwater SAP Figures

Dear Martin,

Enclosed are the revised figures for the Closed Sanitation, Inc. Landfill Groundwater Sampling and Analysis Plan (SAP) that you requested. The figures show an updated property boundary, access easements, and monitoring locations, consistent with the recent updated figures submitted for the site Landfill Gas Monitoring Plan.

Please feel free to contact me at 443-4150 ext. 146 or mwalker@hydrometrics.com if you have any questions.

Sincerely,

Mark Walker
Environmental Scientist

c: Barry Damschen Consulting, LLC



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SEP 04 2009

Dept. of Enviro. Quality
Waste & Underground
Tank Management Bureau

**CLOSED SANITATION, INC. LANDFILL
LEWISTOWN, MONTANA
GROUNDWATER SAMPLING AND ANALYSIS PLAN**

Prepared for:

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5531 York Road
Helena, MT 59602

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November 2007

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**CLOSED SANITATION, INC. LANDFILL
LEWISTOWN, MONTANA
GROUNDWATER SAMPLING AND ANALYSIS PLAN**

1.0 INTRODUCTION

The Sanitation, Inc. Landfill is located approximately two miles east of Lewistown in Fergus County, Montana (Figure 1-1). This document comprises the Sampling and Analysis Plan (SAP) for groundwater monitoring at the Sanitation, Inc. Landfill. The procedures outlined in the SAP are consistent with Montana Department of Environmental Quality (MDEQ) requirements outlined in ARM 17.50.708, including specification of sampling procedures and frequency, analytical parameters and methods, quality assurance and quality control, and health and safety considerations.

1.1 HYDROGEOLOGIC SETTING

The hydrogeology of the landfill vicinity was investigated and described in detail by Damschen & Associates (1995). The site is situated on a ridgetop that functions as a drainage divide between Boyd Creek to the south and a tributary of Breed Creek to the north, and is underlain by fine-grained sediments (sandstone, siltstone, shale) of the Kootenai formation and the Colorado group. Drilling records indicate that these formations dip gently to the northwest.

Damschen & Associates (1995) identified a sandstone layer containing water along the northern boundary of the landfill, and installed two piezometers (SIP-1 and SIP-2) and three monitoring wells (SIMW-1, SIMW-2, and SIMW-3) in 1995 to monitor groundwater within this unit. The wells were completed at depths of 30 to 45 feet below ground surface. The sandstone aquifer could not be located to the south, and was thus characterized as discontinuous and relatively small, with a local recharge zone in the low-lying area to the

CLOSED SANITATION FACILITY LEWISTOWN, MONTANA GROUNDWATER SAMPLING AND ANALYSIS PLAN

1. INTRODUCTION

The following is a summary of the groundwater sampling and analysis plan for the closed sanitation facility in Lewistown, Montana. The plan was developed by the Montana Department of Environmental Quality (DEQ) in cooperation with the Lewistown Sanitation District. The plan is intended to provide a systematic and comprehensive approach to the sampling and analysis of groundwater in the vicinity of the facility. The plan is based on the following assumptions: (1) the facility is a closed sanitation facility; (2) the facility is located in the vicinity of the town of Lewistown, Montana; (3) the facility is a source of groundwater contamination; (4) the facility is a source of groundwater contamination; (5) the facility is a source of groundwater contamination.

2. PURPOSE OF THE PLAN

The purpose of the plan is to provide a systematic and comprehensive approach to the sampling and analysis of groundwater in the vicinity of the facility. The plan is intended to provide a systematic and comprehensive approach to the sampling and analysis of groundwater in the vicinity of the facility. The plan is based on the following assumptions: (1) the facility is a closed sanitation facility; (2) the facility is located in the vicinity of the town of Lewistown, Montana; (3) the facility is a source of groundwater contamination; (4) the facility is a source of groundwater contamination; (5) the facility is a source of groundwater contamination.

The plan is based on the following assumptions: (1) the facility is a closed sanitation facility; (2) the facility is located in the vicinity of the town of Lewistown, Montana; (3) the facility is a source of groundwater contamination; (4) the facility is a source of groundwater contamination; (5) the facility is a source of groundwater contamination.

northeast of the landfill. Damschen & Associates (1995) suggested that the recharge area overlies a thick sequence of Colorado group carbonaceous clay shales, which effectively trap infiltrating water within the Kootenai sandstone above the shale layer. An additional monitoring well (SIMW-4) was installed in 2003 at the request of MDEQ to augment the monitoring well network. This well was completed at a depth of 48 feet below ground surface. Well logs and completion information for the Sanitation, Inc. monitoring wells and piezometers are in Appendix A.

1.2 PURPOSE AND OBJECTIVES

The purpose of this SAP is to provide guidance for routine detection monitoring of groundwater at the Sanitation, Inc. Landfill. The groundwater data collected will be used in statistical testing to evaluate potential impacts from the landfill in terms of statistically significant increases in concentration. As previously described, the SAP includes a discussion of sampling procedures and frequency, analytical parameters and methods, quality assurance and quality control, and health and safety considerations.

1.3 SAMPLING PROCEDURES

1.3.1 Sampling Objectives

The objective described in this SAP was collected as part of the routine detection monitoring program initiated in 1995 (DAMSCHEN, 1995). The objective of detection monitoring was to determine the presence or absence of landfill-related concentrations of groundwater in specific areas of the landfill, and flow direction and to ensure the integrity of monitoring well installations.

1.3.2 Locations and Identification of Wells

Groundwater monitoring well and piezometer locations are shown on Figure 3-1. Each well is uniquely labeled as the well casing or protective casing. Groundwater level measurements are collected at the four monitoring wells and the two piezometers. Water quality samples are

2.0 FIELD SAMPLING PLAN

2.1 SAMPLING FREQUENCY

Water samples from each well shall be collected annually during the high groundwater period (usually between May 1 and June 30). Notification of the sampling event shall be provided to MDEQ via fax or email a minimum of 14 days prior to the anticipated sampling event, providing opportunity for field oversight or collection of split samples as desired.

2.2 SITE ACCESS

The Sanitation, Inc. Landfill is accessible for sampling through an unlocked gate at the entrance to the landfill. Access to the monitoring wells requires a four-wheel drive vehicle if conditions are not dry, since there are no access roads to each well from the entrance. The wells are locked; keys to the locks are available from Mr. Bill Spoja, the owner of the site (phone: 538-8767) or from Barry Damschen (phone: 461-5003). One of the wells (SIMW-2) is located approximately 20 feet north of the site boundary fence, which requires carrying all sampling equipment across the barbed-wire fence.

2.3 SAMPLING PROCEDURES

2.3.1 Sampling Objectives

The samples described in this SAP are collected as part of the routine detection monitoring program outlined in ARM 17.50.708. The objectives of detection monitoring are to determine the presence or absence of landfill-related contamination of groundwater; to monitor water levels, flow rates, and flow direction; and to assure the integrity of monitoring well installations.

2.3.2 Locations and Identification of Wells

Groundwater monitoring well and piezometer locations are shown on Figure 2-1. Each well is uniquely labeled on the well casing or protective casing. Groundwater level measurements are collected at the four monitoring wells and the two piezometers; water quality samples are

collected at three of the four monitoring wells (SIMW-2 through SIMW-4). MDEQ agreed in 2006 to discontinue sampling of well SIMW-1.

2.3.3 Sampling Order

The sampling order for collecting water quality samples from monitoring wells at the Sanitation, Inc. Landfill is as follows: SIMW-2, SIMW-3, SIMW-4.

2.3.4 Sample Acquisition Procedure

The sample acquisition, handling, and equipment decontamination procedures used at the Sanitation, Inc. Landfill shall generally follow the accepted protocol established by the American Society for Testing and Materials Standard D 4448-01 (ASTM, 2001) and by the U.S. Environmental Protection Agency (1993).

Wells will be sounded for static water level and total depth prior to sampling, using a standard water level measurement device. Results of the total depth and static water level measurements will be recorded on the Field Data Sheet (Appendix B).

Water quality samples will be collected from each well using disposable, pre-cleaned plastic (polyethylene) bailers. The wells will be bailed at a constant rate of approximately 0.25 gallons per minute (gpm), to avoid excessive agitation of groundwater or cascading of water down the well screen. The field parameters pH, specific conductance, and water temperature will be measured after each well volume removed (at a minimum). The volume of water within the two-inch diameter well casing will be calculated as follows:

$$\text{volume (gallons)} = [\text{total depth (ft)} - \text{depth to water (ft)}] \times 0.16$$

The total amount of water purged shall be tracked by pouring bailed water into a vessel of known volume (e.g. a 5-gallon bucket). Several of the Sanitation, Inc. monitoring wells can be bailed dry; therefore, samples may be collected either when three well volumes have been purged and field parameters have stabilized, when the well has been bailed dry and allowed to recover such that the water level is above the top of the well screen, or when two hours

have elapsed since bailing dry, presuming enough water is available for sampling after two hours (EPA, 1993).

Field parameter measurements (pH, specific conductance, water temperature) shall be recorded on the Field Data Sheet (Appendix B). Field meters will be calibrated daily according to the manufacturer's specifications (Appendix C), with calibration results recorded on instrument calibration forms (Appendix B). The manufacturer and instrument model number will also be recorded on the calibration form.

Water quality samples will be collected following purging for Table 1 constituents, filtered and preserved in the field as appropriate. The order of collection for field samples, along with required containers and preservatives are shown in the attached Table 2-1. Preservatives and sample containers will be supplied by the analytical laboratory. As noted in Table 2-1, samples collected for dissolved metals analysis will be filtered prior to preservation using a new 0.45- μ m nominal pore-size filter and a pressurizing device, such as a Norton Posi-Filter pressurized bailer. Samples for VOC analysis must be collected with zero headspace (no air bubbles).

A set of timed water depth measurements shall be obtained immediately after purging, in order to assess water level recovery within each well. Recovery measurements will be recorded on the Field Data Sheets for each well.

2.4 SHIPPING AND HANDLING

Samples shall be stored in coolers on ice or under refrigeration at $4 \pm 2^{\circ}\text{C}$ at all times after collection until delivery to the analytical laboratory. All samples collected at the Sanitation, Inc. Landfill (including QC samples) shall be stored and shipped together in a cooler designated solely for storing and shipping Sanitation, Inc. landfill groundwater samples. Any glass sample containers such as VOA vials should be wrapped in bubble wrap or otherwise secured against breakage.

Samples will be shipped or delivered to the analytical laboratory as soon as possible by the most expeditious means available, no more than 72 hours after collection. This time frame will allow for samples collected on Friday to be shipped no later than the following Monday. Ideally, sampling events should be scheduled for earlier in the week to preclude extended times between sampling and shipping. Shipped samples will be accompanied by chain-of-custody documentation, as described below in Section 3.1.4.

2.5 ANALYTICAL PARAMETERS

Analytical parameters for groundwater samples from the Sanitation, Inc. Landfill will be based on the "Table 1" parameters listed in ARM 17.50.708. A complete list of the Table 1 parameters is included in the attached Table 2-2.

2.6 REPORTING

The owner/operator is responsible for submitting sampling results and water elevation data collected at the landfill site to MDEQ within 90 days after sampling is completed. The laboratory reports and field data sheets will be submitted, along with a discussion of groundwater flow direction and seepage velocity, a statistical analysis of the data detailing any statistically significant increases in groundwater concentrations, and any deviations from the approved SAP.

3.0 QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance and quality control (QA/QC) for the landfill groundwater sampling will be maintained through adherence to the requirements of this SAP, as well as through the analysis and review of field and laboratory QC samples, including blanks, duplicates, matrix spikes, matrix spike duplicates, laboratory control samples, and calibration verification samples. Field and laboratory QA/QC requirements are set forth in this section.

3.1 FIELD QA/QC

3.1.1 Sampling Procedures and Documentation

Sampling procedures will follow the protocols outlined above in Section 2.3. Any deviations from these protocols will be noted in field documentation and reported in the semiannual groundwater report to MDEQ. All field procedures and measurements will be documented on the Field Data Sheets in Appendix B.

3.1.2 QC Samples

Field QC samples shall include one field duplicate and one trip blank per monitoring event. Duplicate groundwater samples will be collected by splitting equal portions of sample into two sets of sample containers with unique sample identification numbers. Duplicate samples will be submitted blind to the laboratory. The well selected for duplicate sample collection for a given event is arbitrary.

The groundwater trip blank will consist of deionized, analyte-free water prepared and preserved in the laboratory, transported to and from the field site with other samples, and submitted and analyzed for volatile organics (VOCs) only.

3.1.3 Field Instrument Calibration

Field instruments will be calibrated on a daily basis during sampling activities. Calibration will be completed in accordance to manufacturer specifications (Appendix C). All

calibration information and results shall be recorded on the Field Calibration Sheet included in Appendix B.

3.1.4 Chain-of-Custody

Chain-of-custody involves ensuring that samples are traceable from the time of collection until received by the analytical laboratory. The laboratory is responsible for custody during processing and analysis. A sample is under custody if:

- It is in your possession;
- It is in your view, after being in your possession; or
- It was in your possession and you then placed it in a designated secure or locked area to prevent tampering.

Custody of samples shall be recorded on forms obtained from the analytical laboratory or their equivalent. The sampler shall sign and retain a copy of the chain-of-custody form when samples are relinquished to the laboratory. The laboratory shall maintain copies of the chain-of-custody form and provide the sampler and client with copies upon request. Sample coolers shipped by courier must be taped securely with custody seals placed along the opening edge of the cooler lid prior to shipping in such a manner as to ensure the detection of tampering.

3.2 LABORATORY QA/QC

Field sampling personnel and the landfill owner/operator are not directly responsible for laboratory QA/QC procedures; however, the selected laboratory must have a written QA/QC program in place that meets certain minimum requirements. The selected analytical laboratory for the Sanitation, Inc. Landfill groundwater monitoring program is Energy Laboratories, with Montana locations in Billings and Helena. The QA/QC summary report provided with analytical results shall include laboratory duplicates, laboratory blanks, matrix spikes, matrix spike duplicates, laboratory control samples, and calibration verification samples. The laboratory QA/QC information shall be reviewed and discussed in the semiannual groundwater monitoring reports.

4.0 HEALTH AND SAFETY PLAN

4.1 LEVEL OF PROTECTION

Groundwater sampling at the Sanitation, Inc. Landfill requires Level D protection, as described in 29 CFR 1910.120. This level of protection (for monitoring well sampling) includes disposable latex gloves, eye protection, and coveralls.

4.2 HAZARD EVALUATION

If elevated volatile (gas phase) components are noted in any well and hazard evaluation equipment (LEL meter, hydrocarbon detector) is unavailable, sampling shall cease immediately. A return visit with appropriate monitoring equipment will be required to better characterize potential hazards. If potentially dangerous constituents are discovered through chemical analysis, the sampling objectives, along with the Health and Safety Plan, shall be reevaluated.

4.3 GROUNDWATER CHARACTERISTICS

Very low levels of VOCs have been detected during previous monitoring at the Sanitation, Inc. Landfill. Due to relatively high concentrations of dissolved solids and the potential for landfill-related contamination, ingestion of water from any monitoring well should be avoided.

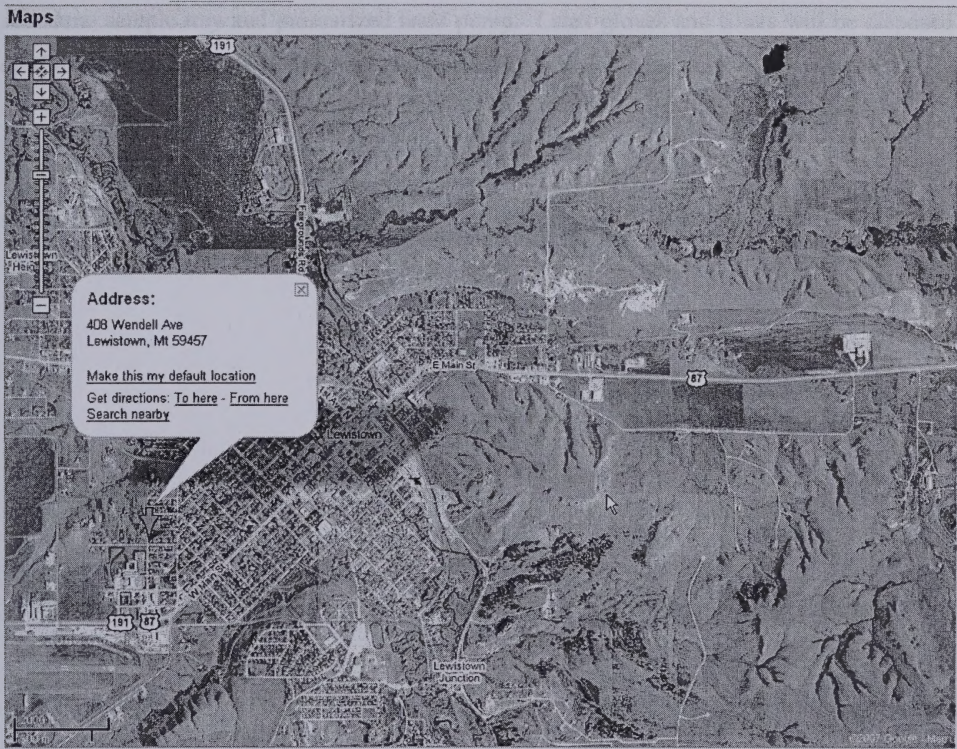
4.4 SPECIAL SITE CONSIDERATIONS

Other safety considerations for the Sanitation, Inc. Landfill groundwater monitoring include potential hazards from encountering poisonous spiders (e.g. black widows) that have commonly been observed within well casings, and rattlesnakes.

4.5 EMERGENCY INFORMATION

The nearest medical facility to the landfill is the Central Montana Medical Clinic, located at 408 Wendell Avenue in Lewistown, phone number (406) 538-7711. A map showing the location of the facility is shown below.

Location of Central Montana Medical Clinic, Lewistown, Montana



4.6 DECONTAMINATION PROCEDURES

Purged Groundwater – Water that is not bottled for analysis will be disposed of on the site but not within 50 feet of any monitoring well.

Equipment/Personnel – Clean water from a municipal supply source should be used with detergent to decontaminate any clothing or skin exposed to contaminated groundwater.

Equipment to be reused shall be rinsed with distilled water, including field meters, well sounders, sample tray and pressurized hand pump. Latex gloves and filters will be disposed of after sampling each well, and new gloves and filters used on the next well.

5.0 REFERENCES

- ASTM, 2001. Standard Guide for Sampling Groundwater Monitoring Wells. ASTM Standard D 4448-01. August 2001.
- Damschen & Associates, 1995. Supplementary Hydrogeological and Soils Study, Sanitation, Inc. Landfill, Lewistown, Montana. April 1995.
- U.S. EPA, 1993. Solid Waste Disposal Criteria Technical Manual. Office of Solid Waste and Emergency Response, EPA 530-R-93-017. November 1993.

TABLE 1. SUMMARY OF THE DATA FROM THE 1990-1991
SURVEY OF THE NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH
SCIENCE

Sample Size	Location	Country	Population
1	Urban	2-100,000	10,000,000
2	Urban	100,000-1,000,000	10,000,000
3	Urban	1-100,000	10,000,000
4	Urban	1-100,000	10,000,000
5	Urban	1-100,000	10,000,000

NOTE: Sample size is based on the number of U.S. cities.

TABLES

**TABLE 2-1. SAMPLE COLLECTION ORDER, CONTAINER AND
PRESERVATION REQUIREMENTS**

Sample Order	Parameter	Container	Preservation
1	VOCs	2 – 40 mL glass VOA	HCl to pH<2; cool to 4 ± 2°C
2	cyanide	1 – 250 mL plastic	NaOH to pH>>12; cool to 4 ± 2°C
3	metals	1 – 250 mL plastic	Filter; HNO ₃ to pH<2; cool to 4 ± 2°C
4	nitrate + nitrite/COD	1 – 250 mL plastic	H ₂ SO ₄ to pH<2; cool to 4 ± 2°C
5	major ions, pH, SC	1 – 500 mL plastic	Cool to 4 ± 2°C

NOTE: Suggested sampling order adapted from U.S. EPA (1993).

TABLE 2-2. DETECTION MONITORING ANALYTICAL PARAMETER LIST (MDEQ TABLE 1)

ADMINISTRATIVE RULES OF MONTANA 6/30/97 17-4437
SOLID WASTE MANAGEMENT 17.50.708

TABLE 1 - GROUND WATER MONITORING PARAMETERS

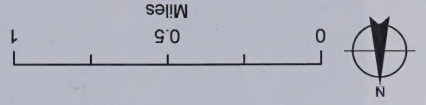
- | | |
|---|----------------------------------|
| 1. Antimony | 14. Nitrate (as N) |
| 2. Arsenic | 15. Nickel |
| 3. Barium | 16. Selenium |
| 4. Beryllium | 17. Silver |
| 5. Cadmium | 18. Sulfate (SO ₄) |
| 6. Chloride | 19. Thallium |
| 7. Chromium | 20. Vanadium |
| 8. Cobalt | 21. Zinc |
| 9. Copper | 22. Chemical Oxygen Demand (COD) |
| 10. Cyanide | 23. pH |
| 11. Iron | 24. Specific conductance |
| 12. Lead | |
| 13. Mercury | |
| 25. The following volatile organic compounds (VOCs by EPA method 8260): | |

- | | |
|--|--|
| • Acetone | • Ethylbenzene |
| • Acrylonitrile | • 2-Hexanone; Methyl butyl ketone |
| • Benzene | • Methyl bromide; Bromomethane |
| • Bromochloromethane | • Methyl chloride; Chloromethane |
| • Bromodichloromethane | • Methylene bromide; Dibromomethane |
| • Bromoform | • Methylene chloride |
| • Carbon disulfide | • Methyl ethyl ketone; MEK |
| • Carbon tetrachloride | • Methyl iodide; Iodomethane |
| • Chlorobenzene | • 4-Methyl-2-pentanone; Methyl isobutyl ketone |
| • Chloroethane | • Styrene |
| • Chloroform | • 1,1,1,2-Tetrachloroethane |
| • Chlorodibromomethane | • 1,1,2,2-Tetrachloroethane |
| • 1,2-Dibromo-3-chloropropane (DBCP) | • Tetrachloroethylene |
| • 1,2-Dibromoethane; (EDB) | • Toluene |
| • o-Dichlorobenzene; 1,2-Dichlorobenzene | • 1,1,1-Trichloroethane |
| • p-Dichlorobenzene; 1,4-Dichlorobenzene | • 1,1,2-Trichloroethane |
| • trans-1,4-Dichloro-2-butene | • Trichloroethene |
| • 1,1-Dichloroethane | • Trichlorofluoromethane |
| • 1,2-Dichloroethane | • 1,2,3-Trichloropropane |
| • 1,1-Dichloroethylene | • Vinyl acetate |
| • cis-1,2-Dichloroethylene | • Vinyl chloride |
| • trans-1,2-Dichloroethylene | • Xylenes |
| • 1,2-Dichloropropane | |
| • cis-1,3-Dichloropropene | |
| • trans-1,3-Dichloropropene | |

ADMINISTRATIVE RULES OF MONTANA 6/30/97 17-4439

FIGURES

Figure 1-1
Closed Sanitation, Inc. Landfill
General Location Map



2005 NAIP aerial photo obtained from Montana NRS





2005 NAIP aerial photo obtained from Montana NRIS

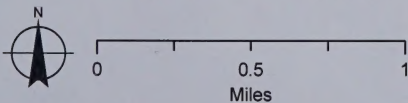
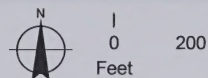


Figure 1-1
Sanitation, Inc. Landfill
General Location Map



2005 NAIP aerial photo obtained from Montana NRIS



K:\PROJECT\8015\SANINC\NEW GW SAP FIGURES\FIG2-1.MXD

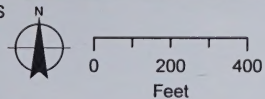
Figure 2-1
Groundwater Monitoring Locations
Closed Sanitation, Inc. Landfill

Legend

-  Monitoring Well
-  Piezometer



2005 NAIP aerial photo obtained from Montana NRIS



K:\PROJECT2045\GIS\FIG2-1.MXD

Figure 2-1
Sanitation, Inc. Landfill
Groundwater Monitoring Locations

APPENDIX A

SANITATION INC. LANDFILL MONITORING WELL AND PIEZOMETER LOGS AND CONSTRUCTION DETAILS

Sanitation, Inc. (andfill)
Lewistown, Montana

Bo. y Name: SIMW-1

Job Number: 95-53B

Client: Sanitation, Inc., Lewistown, MT

Date: 8/15/75

Drilling Method: Air Rotary

Drilling Firm: Sharp Drilling, Sidney, MT

Total Depth: 60 ft.

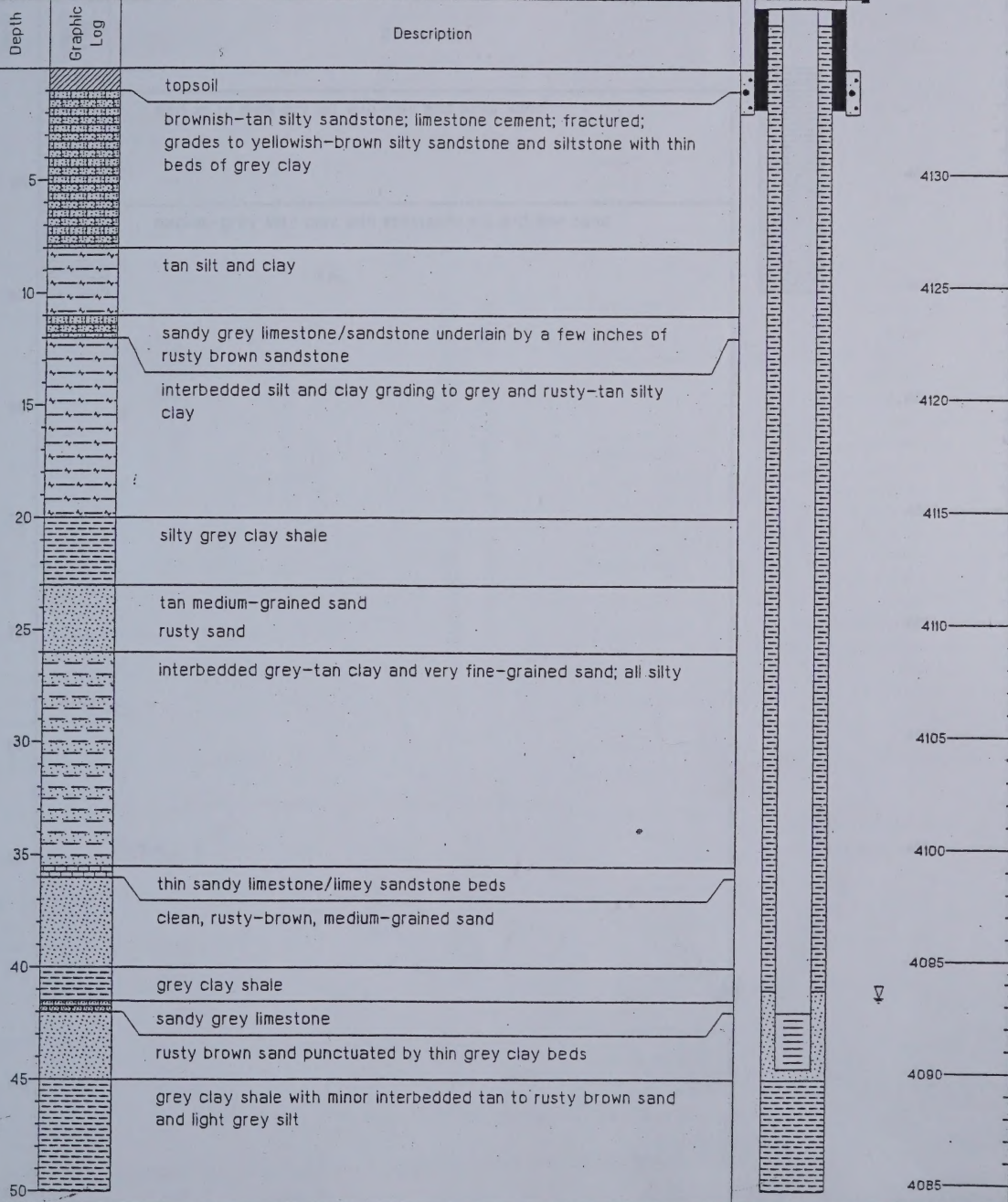
TOC Elevation:

Geologist: Siegmund

Damschen & Associates, Inc.
Helena, Montana

Well Construction
Details

existing fill



Sanitation, Inc. Landfill
Lewistown, Montana



Bo. Name: SIMW-1

Job Number: 95-53B

Client: Sanitation, Inc., Lewistown, MT

Date: 8/15/85

Drilling Method: Air Rotary

Drilling Firm: Sharp Drilling, Sidney, MT

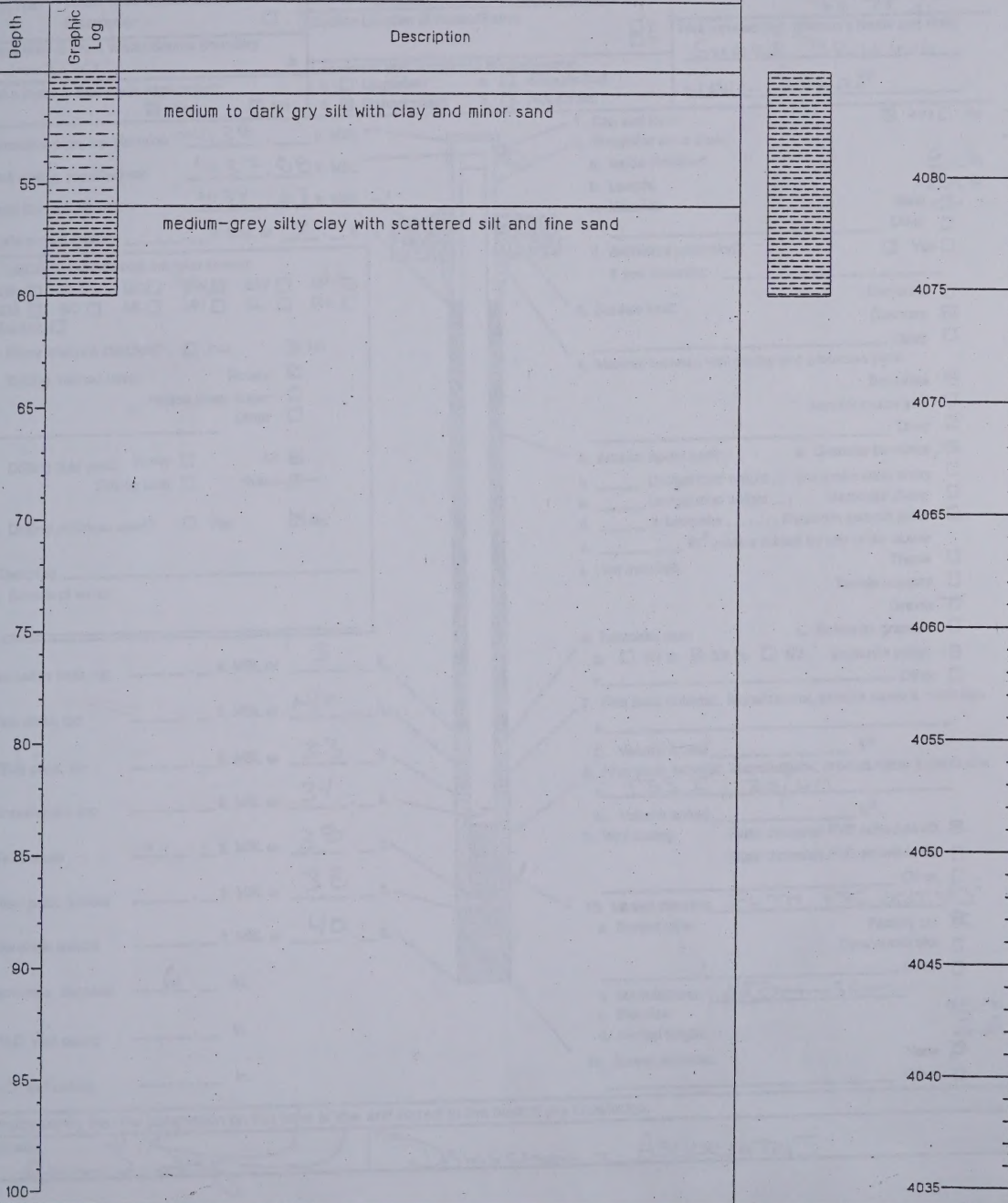
Total Depth: 60 ft.

TOC Elevation:

Geologist: Siegmund

Damschen & Associates, Inc.
Helena, Montana

Well Construction
Details



Route to: Solid Waste ☒ Haz. Waste ☐
Underground Tanks ☐ Other ☐

MONITORING WELL CONSTRUCTION

Facility/Project Name <u>SANITATION, INC.</u>	Local Grid Location of Well _____ ft. <u>N</u> _____ ft. <u>E</u> _____ ft. <u>S</u> _____ ft. <u>W</u>	Well Name <u>SIMW-1</u>
Facility License <u>291</u>	Grid Origin Location Lat. _____ Long. _____ or St. Plane _____ ft. N _____ ft. S	MT Unique Well Number _____ DHES Well Name _____
Type of Well Water Table Observation Well ☐ Piezometer ☐	Section Location of Waste/Source _____ ft. <u>E</u> _____ ft. <u>W</u>	Date Well Installed <u>08/15/95</u> m m d d y y
Distance Well Is From Waste/Source Boundary <u>~200'</u> ft.	Location of Well Relative to Waste/Source u ☐ Upgradient s ☐ Sidegradient d ☒ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm) <u>SHARP DRILLING</u> <u>JOHN SHARP</u>
Is Well a Point of Standards Application? ☒ Yes ☐ No		

A. Protective pipe, top elevation <u>~4138</u> ft. MSL B. Well casing, top elevation <u>4137.88</u> ft. MSL C. Land Surface elevation <u>4134.67</u> ft. MSL D. Surface seal, bottom _____ ft. MSL or <u>3</u> ft. 12. USCS classification of soil near screen: GP ☐ GM ☐ GC ☒ GW ☐ SP ☐ SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐ Bedrock ☐ 13. Sieve analysis attached? ☐ Yes ☒ No 14. Drilling method used: Rotary ☒ Hollow Stem Auger ☐ Other ☐ 15. Drilling fluid used: Water ☐ Air ☒ Drilling Mud ☐ None ☒ 16. Drilling additives used? ☐ Yes ☒ No Describe _____ 17. Source of water: _____ E. Bentonite seal, top _____ ft. MSL or <u>3</u> ft. F. Fine sand, top _____ ft. MSL or <u>N/A</u> ft. G. Filter pack, top _____ ft. MSL or <u>33</u> ft. H. Screen joint, top _____ ft. MSL or <u>34</u> ft. I. Well bottom _____ ft. MSL or <u>38</u> ft. J. Filter pack, bottom _____ ft. MSL or <u>38</u> ft. K. Borehole bottom _____ ft. MSL or <u>40</u> ft. L. Borehole, diameter <u>6</u> in. M. O.D. well casing _____ in. N. I.D. well casing _____ in.	1. Cap and lock? ☒ Yes ☐ No 2. Protective cover pipe: a. Inside diameter: <u>6</u> in. b. Length: <u>3</u> ft. c. Material: Steel ☒ Other ☐ d. Additional protection? ☐ Yes ☐ No If yes, describe: _____ 3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐ 4. Material between well casing and protective pipe: Bentonite ☒ Annular space seal ☐ Other ☐ 5. Annular space seal: a. Granular bentonite ☒ b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ c. _____ Lbs/gal mud weight ... Bentonite slurry ☐ d. _____ % bentonite ... Bentonite cement grout ☐ e. _____ Ft³ volume added for any of the above ☐ f. How installed: Tremie ☐ Tremie pumped ☐ Gravity ☒ 6. Bentonite seal: a. Bentonite granules ☐ b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2. Bentonite pellets ☒ c. _____ Other ☐ 7. Fine sand material: Manufacturer, product name & mesh size a. _____ b. Volume added _____ ft³ 8. Filter pack material: Manufacturer, product name & mesh size a. <u>CSSI 20/40</u> b. Volume added _____ ft³ 9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐ 10. Screen material: <u>FLTH PVC SCH 40</u> a. Screen type: Factory cut ☒ Continuous slot ☐ Other ☐ b. Manufacturer: <u>Johnson</u> c. Slot size: <u>0.015 in.</u> d. Slotted length: <u>2.5 ft.</u> 10. Screen material: None ☐ Other ☐
---	--

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature John S. Sharp Firm DAMSCHEN + ASSOCIATES

Facility/Project Name <u>SANITATION INC</u>	County Name <u>Fergus</u>	Well Name <u>SIMW-1</u>
Facility License Number <u>291</u>	County Code <u> </u>	MT Unique Well Number <u> </u>
		DHES Well Number <u> </u>

- Can this well be purged dry? ☒ Yes ☐ No
- Well development method
 - surged with bailer and bailed ☒
 - surged with bailer and pumped ☐
 - surged with block and bailed ☐
 - surged with block and pumped ☐
 - surged with block, bailed and pumped ☐
 - compressed air ☐
 - bailed only ☐
 - pumped only ☐
 - pumped slowly ☐
 - Other ☐
- Time spent developing well 45 min.
- Depth of well (from top of casing) 47.5 ft
- Inside diameter of well 2 in.
- Volume of water in filter pack and well casing 6 gal.
- Volume of water removed from well ~5 gal.
- Volume of water added (if any) 0 gal.
- Source of water added
- Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. <u>4093.67</u> ft msl	<u>4093.53</u> ft msl
Date	b. <u>8/16/95</u> mm dd yy	<u>8/16/95</u> mm dd yy
Time	c. <u>9:</u> ☒ a.m. ☐ p.m.	<u>9:45</u> ☒ a.m. ☐ p.m.
12. Sediment in well bottom	<u> </u> inches	<u> </u> inches
13. Water clarity	Clear ☐ Turbid ☒ (Describe) <u>LT BRO</u>	Clear ☐ Turbid ☐ (Describe) <u>MILK W/ SILT HAZE</u>

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	<u> </u> mg/l	<u> </u> mg/l
15. COD	<u> </u> mg/l	<u> </u> mg/l

16. Additional comments on development

Well developed by: (Person's Name and Firm)

Name: BRUCE SIEGMUND
Firm: Damschen + Assoc

I hereby certify that the above information is true and correct to the best of my knowledge

Signature: [Signature]
Print Initials: BLS
Firm: Damschen + Assoc

Sanitation, Inc. Landfill
Lewistown, Montana



Bo. Name: SIMW-2

Job Number: 95-53D

Client: Sanitation, Inc., Lewistown, MT

Date: 8/15/95

Drilling Method: Air Rotary

Drilling Firm: Sharp Drilling

Total Depth: 40 ft.

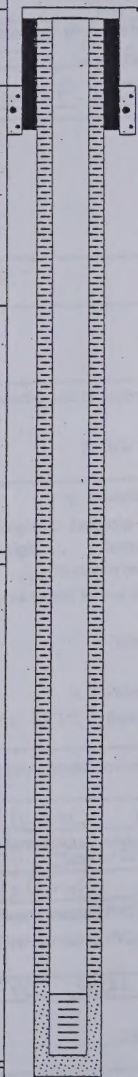
TOC Elevation:

Geologist: Siegmund

Damschen & Associates, Inc.
Helena, Montana

Well Construction
Details

Depth	Graphic Log	Description
5		greyish tan, loose sand and strongly fractured sandstone and siltstone
10		grey sandy clay beds interbedded with silt and fine-grained sand
15		rusty zone
20		sandy limestone interbedded fine-grained tan to brown sand, grey silt and dark grey clay shale
25		rusty rusty rusty
30		rusty brown sand with a few clay and silt beds interspersed
35		dark grey clay shale
40		dark grey clay shale
45		dark grey clay shale
50		dark grey clay shale



4120

4115

4110

4105

4100

4095

4090

4085

4080

4075

Route to: Solid Waste ☒ Haz. Waste ☐
Underground Tanks ☐ Other ☐

MONITORING WELL CONSTRUCTION

Facility/Project Name SANITATION INC.	Local Grid Location of Well _____ ft. ☐ N ☐ S _____ ft. ☐ E ☐ W	Well Name SIMW-2
Facility License 291	Grid Origin Location Lat. _____ Long. _____ or St. Plane _____ ft. N _____ ft. S	MT Unique Well Number _____ DHES Well Name _____
Type of Well Water Table Observation Well ☐ Piezometer ☐	Section Location of Waste/Source ☐ E ☐ W	Date Well Installed 08/15/95 m m d d y y
Distance Well is From Waste/Source Boundary 75 ft.	Location of Well Relative to Waste/Source u ☐ Upgradient s ☐ Sidegradient d ☒ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm) JOHN SHARP SHARP DRILLING
Is Well a Point of Standards Application? ☒ Yes ☐ No		

A. Protective pipe, top elevation <u>4124</u> ft. MSL B. Well casing, top elevation <u>4123</u> ft. MSL C. Land Surface elevation <u>4117</u> ft. MSL D. Surface seal, bottom _____ ft. MSL or <u>3</u> ft. 12. USCS classification of soil near screen: GP ☐ GM ☐ GC ☐ GW ☐ SP ☐ SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐ Bedrock ☐ 13. Sieve analysis attached? ☐ Yes ☒ No 14. Drilling method used: Rotary ☒ Hollow Stem Auger ☐ Other ☐ 15. Drilling fluid used: Water ☐ Air ☒ Drilling Mud ☐ None ☐ 16. Drilling additives used? ☒ Yes ☒ No Describe _____ 17. Source of water: _____	1. Cap and lock? ☐ Yes ☐ No 2. Protective cover pipe: a. Inside diameter: <u>6</u> in. b. Length: <u>5</u> ft. c. Material: Steel ☒ Other ☐ d. Additional protection? ☐ Yes ☐ No If yes, describe: _____ 3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐ 4. Material between well casing and protective pipe: Bentonite ☒ Annular space seal ☐ Other ☐ 5. Annular space seal: a. Granular bentonite ☒ b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ c. _____ Lbs/gal mud weight ... Bentonite slurry ☐ d. _____ % bentonite ... Bentonite cement grout ☐ e. _____ Ft³ volume added for any of the above 6. Bentonite seal: a. Bentonite granules ☐ b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite pellets ☒ c. _____ Other ☐ 7. Fine sand material: Manufacturer, product name & mesh size a. <u>CSSI</u> b. Volume added <u>1/2 BAC</u> ft³ 8. Filter pack material: Manufacturer, product name & mesh size a. <u>CSSI</u> <u>20/40</u> b. Volume added <u>1/2 BAC</u> ft³ 9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐ 10. Screen material: <u>PVC SCH 40</u> a. Screen type: Factory cut ☒ Continuous slot ☐ Other ☐ b. Manufacturer: <u>JOHNSON</u> c. Slot size: <u>0.010 in.</u> d. Slotted length: <u>2.5</u> ft.
E. Bentonite seal, top _____ ft. MSL or <u>3</u> ft. F. Fine sand, top _____ ft. MSL or <u>8</u> ft. G. Filter pack, top _____ ft. MSL or <u>38</u> ft. H. Screen joint, top _____ ft. MSL or <u>37</u> ft. I. Well bottom _____ ft. MSL or <u>39.5</u> ft. J. Filter pack, bottom _____ ft. MSL or <u>40.5</u> ft. K. Borehole bottom _____ ft. MSL or <u>40.5</u> ft. L. Borehole, diameter <u>6</u> in. M. O.D. well casing _____ in. N. I.D. well casing _____ in.	

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature [Signature] Firm DANSCATON + ASSOC

Facility/Project Name <u>SANITATION, INC.</u>	County Name <u>FERGUS</u>	Well Name <u>SIMW-2</u>
Facility License Number <u>291</u>	County Code <u> </u>	MT Unique Well Number <u> </u>
		DHES Well Number <u> </u>

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method
- surged with bailer and bailed ☒
 - surged with bailer and pumped ☐
 - surged with block and bailed ☐
 - surged with block and pumped ☐
 - surged with block, bailed and pumped ☐
 - compressed air ☐
 - bailed only ☐
 - pumped only ☐
 - pumped slowly ☐
 - Other ☐

3. Time spent developing well 45 min.

4. Depth of well (from top of casing) 42.4 ft.

5. Inside diameter of well 2 in.

6. Volume of water in filter pack and well casing 21.3 gal.

7. Volume of water removed from well 5 gal.

8. Volume of water added (if any) 0 gal.

9. Source of water added

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

16. Additional comments on development

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. <u>4089.67</u> ft.	<u>4088.96</u> ft.
Date	b. <u>8/16/95</u> mm dd yy	<u>8/16/95</u> mm dd yy
Time	c. <u>10:15</u> ☒ a.m. ☐ p.m.	<u>11:00</u> ☒ a.m. ☐ p.m.
12. Sediment in well bottom	<u> </u> inches	<u> </u> inches
13. Water clarity	Clear ☐ Turbid ☒ (Describe)	Clear ☐ Turbid ☐ (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids mg/l mg/l

15. COD mg/l mg/l

Well developed by: (Person's Name and Firm)

Name: BRUCE SIEGMUND

Firm: DAMSCHEN + ASSOC.

I hereby certify that the above information is true and correct to the best of my knowledge

Signature: Bruce Siegmund

Print Initials: BLS

Firm: DAMSCHEN + ASSOC.

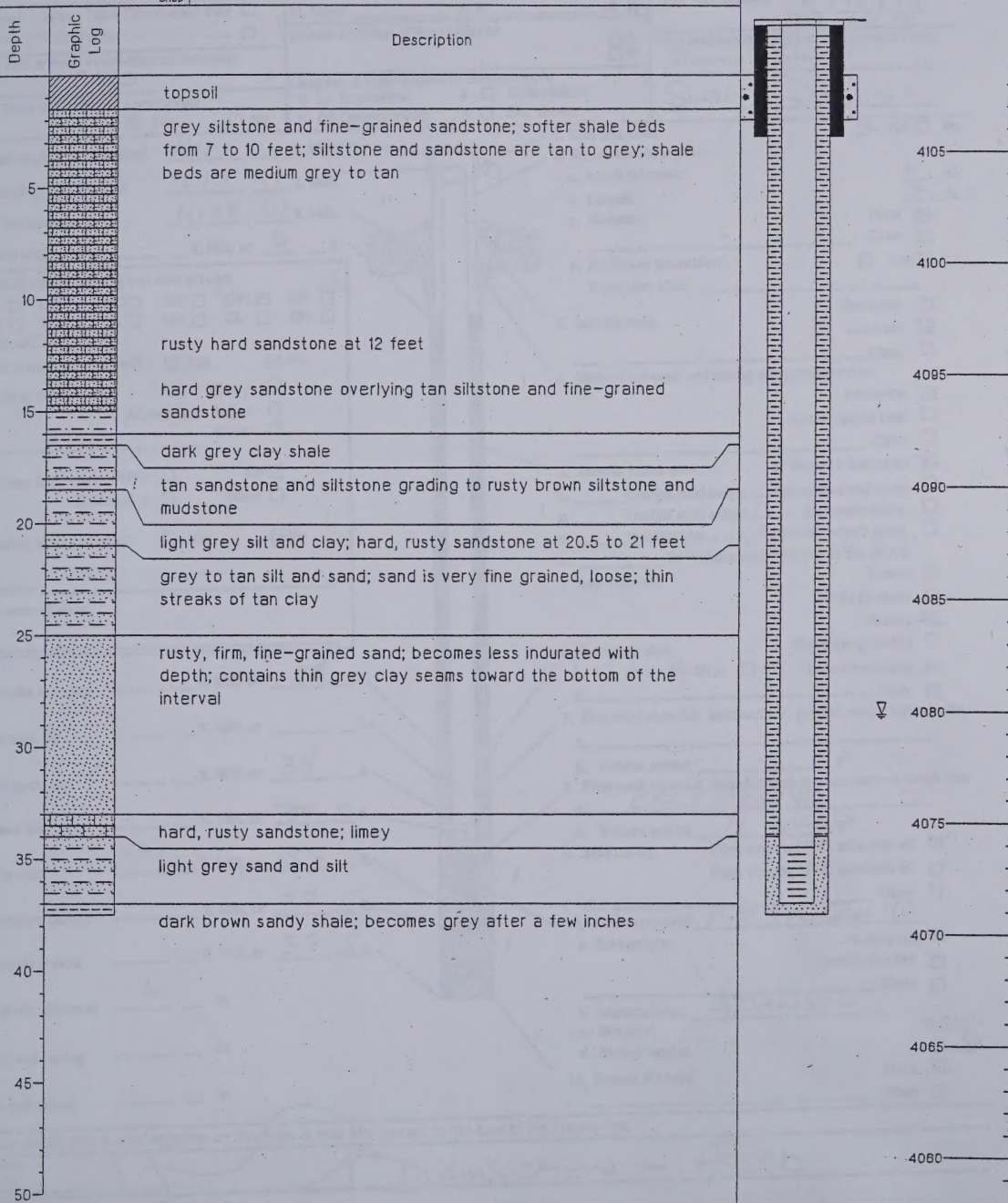
Sanitation, Inc. (and fill)
Lewistown, Montana

Bo. Name: SIMW-3

Job Number: 95-53D
Client: Sanitation, Inc., Lewistown, MT
Date: 8/15/95
Drilling Method: Air Rotary
Drilling Firm: Sharp Drilling, Sidney, MT
Total Depth: 37.5 ft.
TOC Elevation:
Geologist: Siegmund

Damschen & Associates, Inc.
Helena, Montana

Well Construction
Details



Facility/Project Name <u>SANITATION INC</u>	Local Grid Location of Well _____ ft ☐ E ☐ W _____ ft ☐ N ☐ S	Well Name <u>JIMW-3</u>
Facility License <u>291</u>	Grid Origin Location Lat. _____ Long. _____ or _____	MT Unique Well Number _____ DHES Well Name _____
Type of Well Water Table Observation Well ☐ Piezometer ☐	St. Plane _____ ft N _____ ft S	Date Well Installed <u>8/15/95</u> mm dd yy
Distance Well is From Waste/Source Boundary <u>250</u> ft	Section Location of Waste/Source ☐ E ☐ W	Well Installed By: (Person's Name and Firm) <u>JOHN SHARP</u>
Is Well a Point of Standards Application? ☒ Yes ☐ No	Location of Well Relative to Waste/Source u ☐ Upgradient s ☐ Sidegradient d ☒ Downgradient n ☐ Not Known	<u>SHARP DRILLING</u>

A. Protective pipe, top elevation: <u>4111</u> ft. MSL	1. Cap and lock? ☒ Yes ☐ No
B. Well casing, top elevation: <u>4110.91</u> ft. MSL	2. Protective cover pipe: a. Inside diameter: <u>6</u> in. b. Length: <u>3</u> ft. c. Material: ☒ Steel ☐ Other ☐ d. Additional protection? ☐ Yes ☐ No If yes, describe: _____
C. Land Surface elevation: <u>4108.41</u> ft. MSL	3. Surface seal: ☐ Bentonite ☒ Concrete ☐ Other ☐
D. Surface seal, bottom: <u>3</u> ft. MSL or <u>3</u> ft.	4. Material between well casing and protective pipe: ☐ Bentonite ☒ Annular space seal ☐ Other ☐
12. USCS classification of soil near screen: GP ☐ GM ☐ GC ☐ GW ☒ SW ☐ SP ☐ SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐ Bedrock ☐	5. Annular space seal: a. Granular bentonite ☒ b. _____ lbs/gal mud weight ... Bentonite-sand slurry ☐ c. _____ lbs/gal mud weight ... Bentonite slurry ☐ d. _____ % bentonite ... Bentonite cement grout ☐ e. _____ Ft ³ volume added for any of the above
13. Sieve analysis attached? ☐ Yes ☒ No	f. How installed: ☐ Tremie ☐ Tremie pumped ☐ Gravity ☒
14. Drilling method used: Rotary ☒ Hollow Stem Auger ☐ Other ☐	6. Bentonite seal: a. Bentonite granules ☐ b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite pellets ☒ c. _____ Other ☐
15. Drilling fluid used: Water ☐ Air ☒ Drilling Mud ☐ None ☐	7. Fine sand material: Manufacturer, product name & mesh size a. _____ b. Volume added _____ ft ³
16. Drilling additives used? ☐ Yes ☒ No	8. Filter pack material: Manufacturer, product name & mesh size a. <u>CSSI 20/40</u> b. Volume added <u>1/2 BAG</u> ft ³
Describe _____	9. Well casing: ☒ Flush threaded PVC schedule 40 ☐ Flush threaded PVC schedule 80 ☐ Other ☐
17. Source of water: _____	10. Screen material: <u>F-T PVC SCH 40</u> a. Screen type: ☒ Factory cut ☒ Continuous slot ☐ Other ☐ b. Manufacturer: <u>JOHNSON</u> c. Slot size: <u>0.010</u> in. d. Slotted length: <u>2.5</u> ft.
E. Bentonite seal, top: _____ ft. MSL or <u>34</u> ft.	10. Screen material: ☐ None ☒ Other ☐
F. Fine sand, top: _____ ft. MSL or _____ ft.	
G. Filter pack, top: _____ ft. MSL or <u>34</u> ft.	
H. Screen joint, top: _____ ft. MSL or <u>34.5</u> ft.	
I. Well bottom: _____ ft. MSL or <u>37</u> ft.	
J. Filter pack, bottom: _____ ft. MSL or <u>37.5</u> ft.	
K. Borehole bottom: _____ ft. MSL or <u>37.5</u> ft.	
L. Borehole, diameter: <u>6</u> in.	
M. O.D. well casing: _____ in.	
N. I.D. well casing: _____ in.	

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature James J. Jorgensen Firm D. Amsetten + Assoc

Facility/Project Name <u>SANITATION INC.</u>	County Name <u>FERGUS</u>	Well Name <u>SIMW-3</u>
Facility License Number <u>291</u>	County Code _____	MT Unique Well Number _____
		DHES Well Number _____

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method
- surged with bailer and bailed ☒
 - surged with bailer and pumped ☐
 - surged with block and bailed ☐
 - surged with block and pumped ☐
 - surged with block, bailed and pumped ☐
 - compressed air ☐
 - bailed only ☐
 - pumped only ☐
 - pumped slowly ☐
 - Other _____ ☐

3. Time spent developing well 45 min.

4. Depth of well (from top of casing) 39.2 ft

5. Inside diameter of well 2 in.

6. Volume of water in filter pack and well casing 1.3 gal.

7. Volume of water removed from well ~6 gal.

8. Volume of water added (if any) _____ gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

16. Additional comments on development

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. <u>4080.70</u> ft	<u>4079.38</u> ft
Date	b. <u>8/16/95</u> mm dd yy	<u>8/16/95</u> mm dd yy
Time	c. <u>11:15</u> ☒ a.m. ☒ p.m.	<u>72:00</u> ☒ a.m. ☒ p.m.
12. Sediment in well bottom	_____ inches	_____ inches
13. Water clarity	Clear ☐ Turbid ☒ (Describe) _____	Clear ☒ Turbid ☐ (Describe) _____

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids _____ mg/l

15. COD _____ mg/l

Well developed by: (Person's Name and Firm)

Name: Bruce Siegmund

Firm: DAMSCHEIN + ASSOCIATES

I hereby certify that the above information is true and correct to the best of my knowledge

Signature: [Signature]

Print Initials: [Initials]

Firm: DAMSCHEIN + ASSOC.

Sanitation, Inc. (and fill)
Lewistown, Montana

Boring Name: SIP-1

Job Number: 93-51
Client: Sanitation, Inc., Lewistown, MT
Date: 1/23/95
Drilling Method: Air Rotary
Drilling Firm: Sharp Drilling
Total Depth: 40 ft.
TOC Elevation:
Geologist: Siegmund

Damschen & Associates, Inc.
Helena, Montana

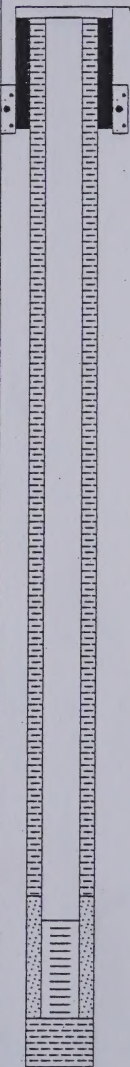
Well Construction
Details

existing fill



1 inch

Depth	Graphic Log	Description
0		silty tan clay and clayey silt, interbedded
5		
10		
15		reddish maroon sandy claystone
16		tan sand, fine-grained, loose
17		fine-grained, hard, well-indurated sandstone
18		grey sand as above, loose, possibly more fines
20		tan sandy siltstone, variably indurated, but overall is firm
25		rusty silty sandstone; firm
26		interbedded silt and clay
30		rusty sand interbedded with thin clay streaks; sand is limonitic, very fine-grained with ample silt fraction;
35		wet silty sand, making a little water
36		resistant sandstone; cuttings very wet; saturated
40		black shale



4115

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4075

4070

Sanitation, Inc. (and fil)
Lewistown, Montana

Bo. Name: SIP-2

Job Number: 95-53D

Client: Sanitation, Inc., Lewistown, MT

Date: 1/23/95

Drilling Method: Air Rotary

Drilling Firm: Sharp Drilling

Total Depth: 54 ft.

TOC Elevation:

Geologist: Siegmund

Damschen & Associates, Inc.
Helena, Montana

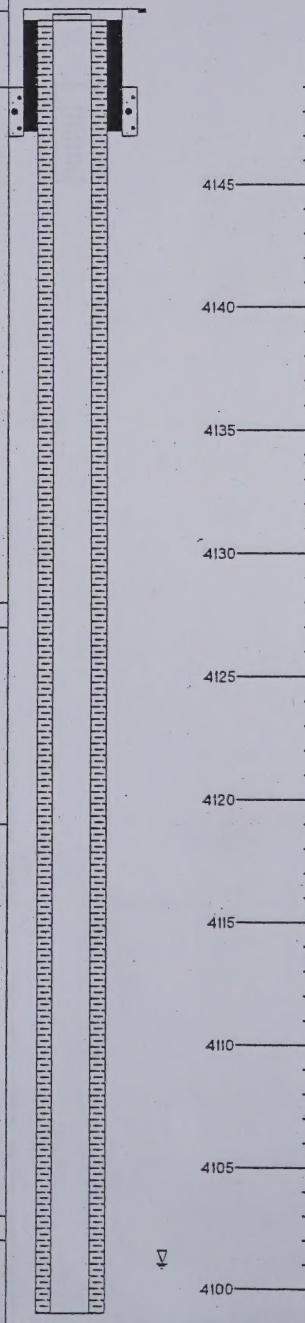
Well Construction
Details

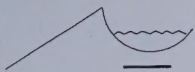
existing fill



1" = 10'

Depth	Graphic Log	Description
5		sandy siltstone and mudstone rusty red very fine-grained sandstone and sandy siltstone fairly hard; turns from light grey to brownish grey rusty interbedded with thin strata of grey clay rusty sandstone, silty, very hard; limestone-cemented Light grey clay shale and rusty sand mostly sandy silt interbedded with sandy clay shale; silt is light grey, clay is medium grey hard grey sandstone, very fine-grained, sucrosic rusty sandstone grey sandstone as above loose buff-grey sand rusty rusty hard sandstone, grey, fine-grained with some limonitic streaks





HYDROMETRICS INC.

Consulting Scientists and Engineers
Helena, Montana

Hole Name: SIMW-4

Date Hole Started: 8/27/03 Date Hole Finished: 8/27/03

Client: Barry Damschen Consulting

Project: Sanitation, Inc.

County: Fergus State: Montana

Property Owner: Bill Spoja

Legal Description: Section 7, T15N, R19E

Descriptive Location: SE Corner of Sediment Basin

Recorded By: R. Anderson

Drilling Company: Sharp Drilling

Driller: John Sharp

Drilling Method: Direct Rotary

Drilling Fluids Used: Air

Purpose of Hole: Monitoring Well

Target Aquifer: First Water

Hole Diameter (in): 6 inches

Total Depth Drilled (ft): 49.5

WELL COMPLETION	Y/N	DESCRIPTION	INTERVAL
Well Installed?	Y	2-inch, flush threaded, Sch 40, PVC	+2.5 to 48.5 ft
Surface Casing Used?	Y	6-inch diameter steel	+2.8 to 3.0 ft
Screen/Perforations?	Y	0.010-inch slot, Sch 40, PVC	43 to 48 ft
Sand Pack?	Y	10/20 Colo. Silica Sand	40 to 49.5 ft
Annular Seal?	Y	Bentonite Crumbles	1.5 to 40 ft
Surface Seal?	Y	Concrete	0 to 1.5 ft

DEVELOPMENT/SAMPLING

Well Developed?	Y	Hand Bail
Water Samples Taken?	N	
Boring Samples Taken?	N	

Static Water Level Below MP: 39.60 ft

Date: 8/27/03

MP Description: Top of PVC Casing

MP Height Above or Below Ground (ft): 2.5 ft

Surface Casing Height (ft): 2.80

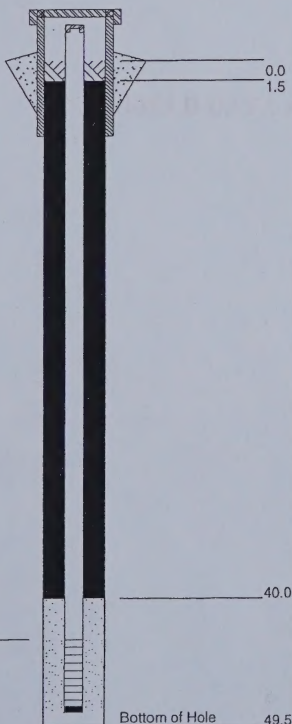
Riser Height (ft): 2.50

Ground Surface Elevation (ft): 4,075.5

MP Elevation (ft): 4078.07

Remarks: Well completed on SE corner of sediment basin berm. Made one to two gpm by blowing with rig.

WELL CONSTRUCTION



GRAPHICS

GEOLOGICAL DESCRIPTION

0.0 - 6.0'

Silty Sand and Gravel

Tan silty, gravelly sand. Dry. Low cohesion. Fill.

6.0 - 10.0'

Clay

Gray silty clay, stiff. Moderately calcareous. Dry. Probable shale bed.

10.0 - 13.0'

Shale

Yellowish tan silty fine sand. Well sorted. Non-calcareous. Dry. 70% rounded to subrounded fine sand, 30% silt. Poorly indurated, soft, easy drilling.

13.0 - 16.0'

Sandstone

Tan to light brown fine sand. Well sorted. Non-calcareous. Dry. 90+% fine subrounded sand. Moderately indurated. Harder drilling than above.

16.0 - 19.0'

Sandstone

Light brown fine sand. Very well sorted. Non-calcareous. Dry. Moderately indurated. Similar drilling as 13 to 16 feet.

19.0 - 40.0'

Sandstone with Shale Beds

Reddish silty fine sand alternating with tan silty shale beds. Overall 80% sandstone/20% shale throughout interval. Damp at 20 feet. Non-calcareous. Sandstone with interbedded shale beds.

40.0 - 41.0'

Sandstone

Yellow-tan silty fine sand. Well sorted. Non-calcareous. 70% rounded to subrounded fine sand, 30% silt. Moderately indurated.

41.0 - 42.0'

Sandstone

Blue-gray fine silty sand (sandstone). Well sorted. Non-calcareous. Moist, poorly indurated. Distinctive metallic-blue color. Saturated at 42 feet.

42.0 - 49.5'

Sandstone

Varying tan/red-brown very fine silty sand (sandstone). Well sorted. Non-calcareous. Saturated. Moderately indurated. Thin tan shale bed 47 to 47.5 feet. Bottomed out at 48.5 feet in red-brown fine sandstone.

APPENDIX B

FIELD DATA AND CALIBRATION SHEETS

pH – SC – Temp.

Instrument Calibration Form

Meter Type: HyDac D16 PCT/PH Comp (033538)

Serial No: 020644559

Project Name: _____

Date: _____

Personnel: _____

Weather: _____

PH CALIBRATION

Time	Buffer	Temperature	Reading
	4		
	7		
	10		

Calibration Check: _____

SPECIFIC CONDUCTANCE CALIBRATION

Time	Standard	Temperature	Reading	Cell Factor

Notes:

BARRY DAMSCHEN CONSULTING, LLC.
Helena, Montana

Ground-Water Monitoring Field Report

Project: _____ Well: _____

Personnel: _____

Date: _____ Time: _____

Conditions: _____

Static Water Level: _____ Total Depth Purged: _____

Purge Method: _____ Volume Purged: _____

	Volume	Temperature	Conductivity	pH
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____

Pumping Level: _____ (Bladder Pump)

or

Recovery (Inertial or bailer):

h1 _____ h2 _____ time _____ depth: _____

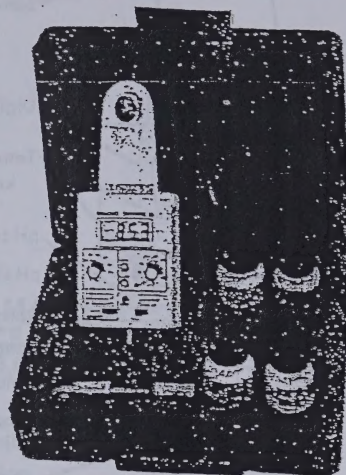
Comments:

APPENDIX C

FIELD EQUIPMENT OPERATION MANUALS AND MATERIAL SAFETY DATA SHEETS

FEATURES

- Digital display liquid-crystal type, 3-1/2 digit
- Visual warning when battery needs to be replaced
- 9 Volt Alkaline Battery
- Automatic battery strength compensation
- Rugged ABS (Acrylonitrile Butadiene Styrene) instrument case plus handy carrying case



Conductance measurement

4 ranges, measured in micromhos

0 to 20

0 to 200

0 to 2,000

0 to 20,000

Integral sample cup

Accessible Calibration Adjustment

Temperature measurement

0 to 160° Fahrenheit range

Integral sample cup

pH measurement

0 to 14 range

Slope and zero adjustments on face of unit

External electrode

Buffer solutions available

ACCURACY

Conductivity $\pm 2\%$ Full Scale

Temperature $\pm 2^\circ$ Fahrenheit

pH $\pm .01$ pH units of 77° Fahrenheit

BENEFITS

- Eliminates titration procedures to determine the strength of cleaning solutions
- Detects the presence of carry-over or other contaminants in steam condensate (conductance measurement). Also monitors the effectiveness of condensate return line chemical treatment (pH measurement)
- Integral sample cup eliminates external probe for conductance and temperature measurement
- Multiple range selection improves resolution
- Quick determination of Dissolved Solids concentration and pH in Cooling Tower and Boiler water
- Covers the full range of conductance and pH without the need of an adapter
- External pH electrode enables routine replacement of electrode

ORDERING INFORMATION

(Controller Weight:

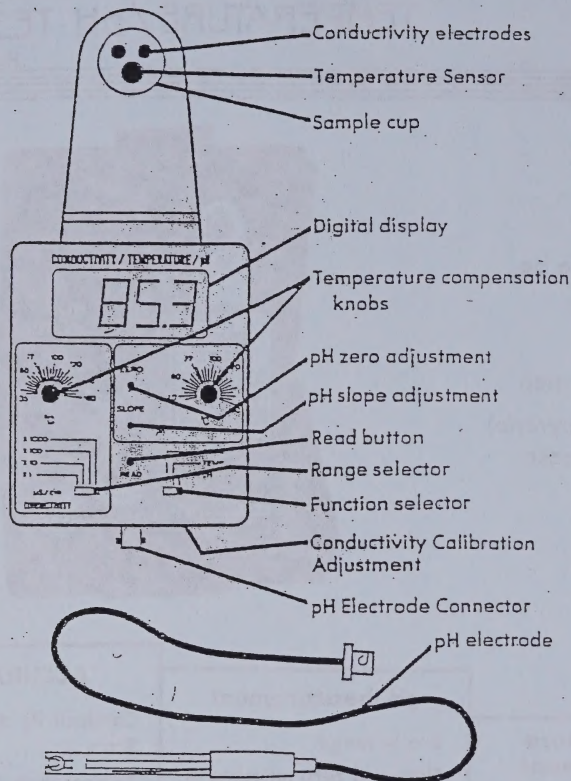
3# gross

1# 12 oz. net

Dimensions:

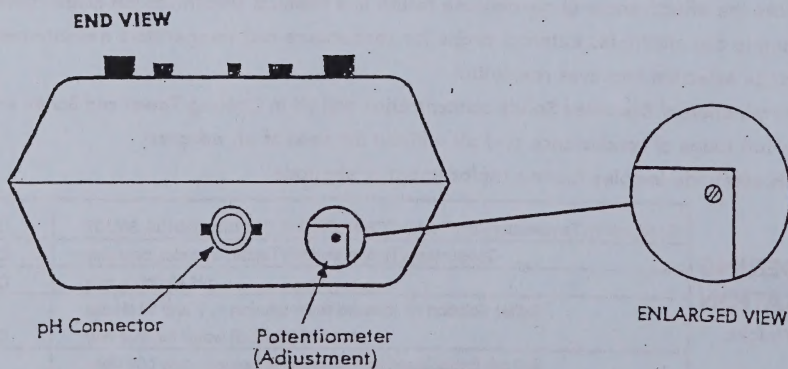
11"Lx8-1/2"Wx4"H)

Conductivity/Temperature/pH Tester COMPLETE incl. 301353, 850136, 850137	Catalog No. 910129
Conductivity/Temperature/pH Tester, includes case only	Catalog No. 301353
pH electrode only	Catalog No. 850136
Buffer Solution Kit includes buffer solution 4, 7 and 10 pH and bottle of (distilled) water for rinse only	Catalog No. 850137
500 ml. Bottle Standard Conductance Solution only (.01 Molar Potassium Chloride), 1413 micromhos	Catalog No. 905770



TESTER IN USE (Measuring pH)

CONDUCTIVITY CALIBRATION



(Note-Hole is normally covered by a black plug)

For additional information, request a copy of our publication HI 831-1.

INSTRUCTION MANUAL DIGITAL CONDUCTANCE, TEMPERATURE AND pH TESTER, CATALOG No. 301353

Parameters:

Conductance 4 ranges

- 0 to 20 μ /cm
- 0 to 200 μ /cm
- 0 to 2,000 μ /cm
- 0 to 20,000 μ /cm

Integral sample cup

Accessible internal calibration potentiometer

Standard solution available:

500 ml. Bottle of .01 Molar Potassium
Chloride 1413 micromhos @ 77° F.

pH 0 to 14 range

Slope and zero adjustments on face of unit

External electrode (purchased separately)

Buffer solution kit available, includes:

- Buffer solutions, 4, 7 and 10 pH
- Bottle of (distilled) water for rinse

Temperature 0 to 160°F

Integral sample cup

Accuracy Conductivity $\pm 2\%$ Full scale at 77°F

Temperature $\pm 2^\circ\text{F}$

pH $\pm .01$ pH units at 77°F

Operating Instructions:

1. Rinse the inside of sample cup with liquid to be measured. (This is especially important if samples with a wide range of conductivity or pH are to be measured.)
2. Fill sample cup. (see Figure 1).

CAUTION: THE MAIN BODY IS NOT WATER-PROOF
(Do not subject unit to splashing water).

CAUTION: UNIT DESIGNED FOR AQUEOUS SOLUTIONS ONLY!

3. Fill sample cup at least 2/3 full. If the sample is hot boiler water, allow to cool to 160°F, or below.
4. Slide the right hand function switch to "TEMP" and push the "READ" button. If temperature reading is not stable, empty & refill cup several times to bring cup and sample to the same temperature.
5. Read the temperature on the digital display panel and adjust both temperature compensation knobs accordingly.
6. If the approximate conductance is known, slide the left hand range selector switch to the proper range.

Example: If you expect the sample to be around 2000 micromhos, slide the left hand selector switch to x1000.
7. Slide the right hand function switch to "COND" and push the "READ" button.

8. Multiply the digital display reading by the factor indicated by the position of the left hand range switch to determine conductance.

Example: A display reading of 1.00 with the left hand range selector switch indicating x1000 is:
1.00 x 1000 or 1000 μ /cm

Note: If a single "1" appears on the left hand side of the digital display, the sample conductance is higher than the selected range. Slide the left hand (range) selector switch in one step intervals until a 3 or 4 digit display appears.

Conversely, if a decimal display appears (such as 0.11) move the range selector switch to the left until a 3 or 4 digit number, 1.00 or larger, appears on the display. This puts the unit in a range affording the best accuracy. Caution: A single "1" always means that the conductance is higher than the selected range.

9. Slide the right hand function selector switch to "pH".
10. Insert the pH cable connector onto the tester. Push on and twist clockwise.
11. Remove the tape from the plastic storage cap.
12. Remove the plastic storage cap slowly.
13. Place the pH electrode in the sample cup or any non-metallic container holding the remainder of the sample to be measured. If you use the tester's sample cup, you will have to hold the electrode.

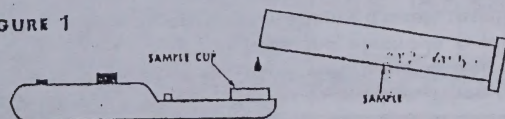
14. Press the "READ" button; pH value will appear on the digital display.

15. Always obtain conductivity reading before placing pH probe in sample cup. pH probes tend to carry contamination over into the sample.

CAUTION:

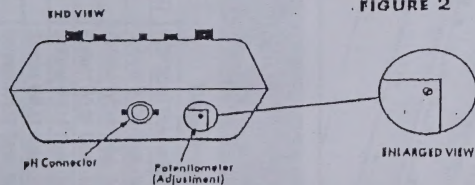
The main body is not waterproof.

FIGURE 1



CONDUCTIVITY CALIBRATION

FIGURE 2



CALIBRATION

Temperature and Conductance are factory calibrated. You may check conductance accuracy with a solution of known conductance and recalibrate, if necessary.

See Figure 2. To recalibrate conductance, remove black plug revealing the adjustment potentiometer screw. Add standard solution to cup, discard and refill. Repeat procedure until the digital display indicates the same value twice in a row. Adjust the potentiometer until the digital display indicates the known value of conductance. To increase the digital display reading, turn the adjustment potentiometer screw counterclockwise (clockwise to decrease).

To standardize the pH electrode and meter, place the pH electrode in the 7.0 buffer bottle. Adjust the "ZERO" potentiometer on the face of the tester so that the digital display indicates 7.00.

Then place the pH electrode in the 4.0 or 10.0 buffer bottle (depending on where you expect the actual measurement to be). Adjust the "SLOPE" potentiometer on the face of the tester so that the digital display indicates the value of the buffer chosen.

NOTE: There is interaction between the "ZERO" and "SLOPE" adjustments, so the procedure should be repeated several times.

DO NOT SUBJECT THE pH ELECTRODE TO FREEZING TEMPERATURES!

It is good practice to rinse the electrode in distilled water when going from one buffer to another. When not in use the cap should be kept on the electrode. Keeping the cotton in the cap moist will keep the electrode ready to use. Moisten the cotton frequently (once a week, usually).

Maintenance

Battery replacement

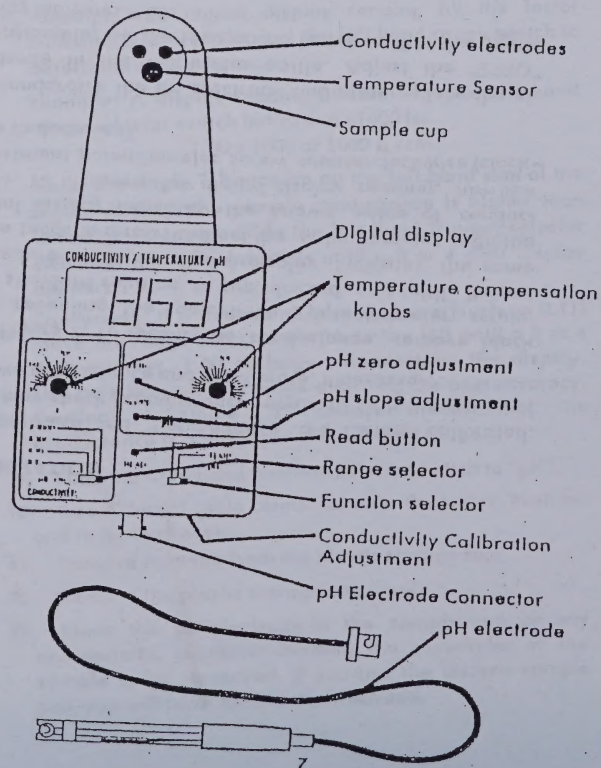
The battery is located behind the snap-off cover on the bottom of the tester. Use a small tool to pop out the cover. Replace battery with a 9 volt; an alkaline battery such as Duracell MN 1604. Replace the battery whenever "LO BAT" appears on the display.

Sample cup:

The carbon electrodes in the cup may be cleaned with a mild abrasive, 400 grit or finer on the end of the flat surface.

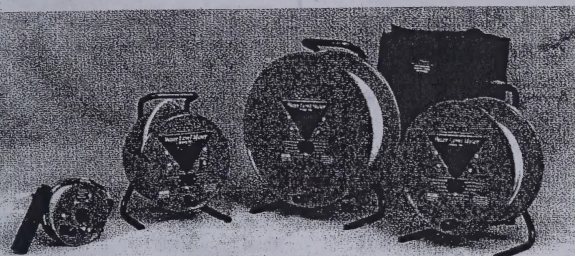
SPECIAL NOTE: To avoid ever having to resort to harsher methods of cleaning, when rinsing cup out with liquid to be measured, wipe cup with paper towel or kleenex and rinse again.

Wipe cup after every sample and rinse with tap water when possible.



Solinst Model 101

The Solinst Model 101 Flat Tape Water Level Meter is recognized as the industry standard for quality and reliability in water level measurement devices. For measuring the depth of water in wells, boreholes, and standpipes.



Water Level Meters

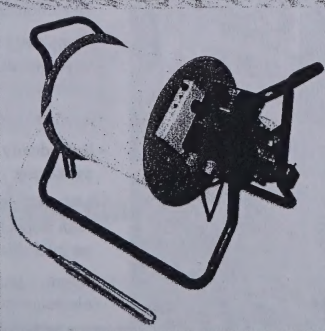
Features

- Readings to 1/100 ft.
- Sensitivity adjustable to conductivity
- Permanent, not stamped tape markings
- Stranded stainless steel conductors
- Rugged, free standing reel
- Corrosion-proof components
- Stainless steel environmental probes
- Meter tapes also available

Cat. No.	Cable Length	P2 or P3 Probe
SOL-50*	50 feet	\$ 413.00
SOL-100*	100 feet	473.00
SOL-150*	150 feet	500.00
SOL-200*	200 feet	593.00
SOL-250*	250 feet	600.00
SOL-300*	300 feet	713.00
SOL-400*	400 feet	833.00
SOL-500*	500 feet	970.00
SOL-650*	650 feet	1,150.00
SOL-750*	750 feet	1,270.00
SOL-1000*	1000 feet	1,570.00
SOL-CB	Other Options: Carrying Bag SM	\$ 60.00
	Med	70.00
SOL-TG	Tape Guide	20.00

* Place Probe Option (P2, P6) after dash. Note: P6 is a \$28.00 upgrade. Longer Reels are available.

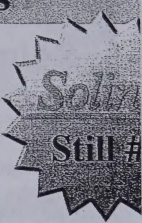
Power Reel



Power Reels: Power reels can be very useful to allow faster or less strenuous operation of longer lengths of tape. The 100 volt power reels are available on request.

Carrying Bags: Padded nylon carrying bags are available as an optional extra. The standard carrying bag has a convenient shoulder strap, zippered front pocket, zippered top, and a grommet in the base to prevent moisture buildup.

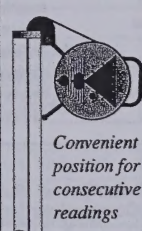
Enviro-Tech is a leading Solinst US Distributor. By purchasing in volume we can pass discounts directly to our clients. We will match any price.



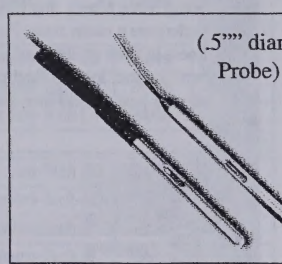
Probe & Tape Options

All probes are designed to reduce or eliminate problem with cascading water. The following options are available:

- P2 Stainless Steel: with a neoprene strain relief. 0.5" dia. by 8.25" long.
- P6 Same as above but waterproof to 1000-feet plus

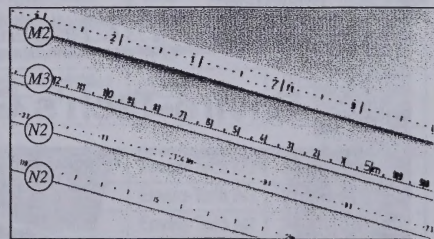


Convenient position for consecutive readings



(.5" diam Probe)

- Tape Options (M2 is standard)
- M2 Feet and tenths: with markings every 1/100 ft
- M3 Meters and centimeter: with markings every N2 and N3 As below, but on the narrow 1/4" tape for Mini 101 Water Level Meter



Cat. No.	Description	
SOL-107327	SCP 3000 Power Reel w/Electronics	\$
SOL-50	Solinst WLM Tape, 50'	
SOL-100	Solinst WLM Tape, 100'	
SOL-150	Solinst WLM Tape, 150'	
SOL-200	Solinst WLM Tape, 200'	
SOL-250	Solinst WLM Tape, 250'	
SOL-300	Solinst WLM Tape, 300'	
SOL-400	Solinst WLM Tape, 400'	
SOL-500	Solinst WLM Tape, 500'	

Gelman Groundwater Filters

1 AquaPrep Filter

The AquaPrep Filter is an affordable alternative for smaller samples and easy-to-filter, particle-free groundwater samples. It has 20 cm² of effective filtration area.

2 AquaPrep-V

The AquaPrep-V™ offers the same size as the AquaPrep, but incorporates Gelman Sciences nylon-supported membrane, which is very popular for groundwater applications.

3 High-Capacity Groundwater Sampling Filter

Like the Enviro-Tech filter above, this filter is also bagged and labeled with QA/QC certification, as shown. And as with our other brand name filters, this filter undergoes a clean rinse. For the finest in filter quality and certification, look to Enviro-Tech as your best QuickFilter source.

QuickFilter Certification

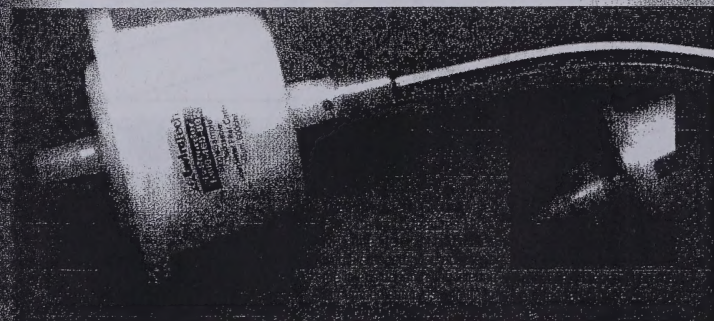
All QuickFilter cartridges are certified to exhibit non-detectable levels of the following analytes based on analysis of effluent water using the procedure described below. Analysis is performed by an outside independent testing laboratory utilizing standard US EPA methods.

Element	MDL (mg/L)	Element	MDL (mg/L)	Element	MDL (mg/L)
Aluminum	0.040	Chromium	0.001	Nickel	0.002
Antimony	0.002	Cobalt	0.001	Potassium	0.1
Arsenic	0.001	Copper	0.004	Selenium	0.004
Barium	0.005	Iron	0.01	Silver	0.0002
Beryllium	0.0002	Lead	0.002	Sodium	0.040
Cadmium	0.0002	Magnesium	0.02	Sulfate	0.025
Calcium	0.03	Mercury	0.0002	Thallium	0.002
Chloride	1.0	Molybdenum	0.005	Zinc	0.005

Product	Inlet/Out Connection	0.45µm Membrane	Effective Filtration Area	Qty.	Cat. No.	Price
1 AquaPrep (Gelman)	1/4-1/2 in. Hose Barb	Thermopor™	20 cm ²	20/pack	AQU-4270	\$158.00
2 AquaPrep-V™ (Gelman)	1/8 in. NPT	Versapor	20 cm ²	20/pack 100/pack	AQU-4274 AQU-4274	158.00 675.00
3 High Capacity Groundwater Filter (QuickFilter®)	1/8 in. NPT	Polyethersulfone	609 cm ²	1/pack 10/pack 50/pack	AQU-GF-1 AQU-GF-10 AQU-GF-100	20.00 190.00 850.00

See Tubing Chart on Page 18 for Tubing Prices and Sizes

4 Enviro-Tech's Groundwater Filter Cartridge



High Capacity

45 micron,
>600 cm² NPT
and barbed
inlet fittings

Designed especially for filtering groundwater samples

Cat No.	Product	List	Extended
4 ET-GF-1	GWE High Capacity Filter Single	\$15.50 ea.	\$15.50
ET-GF-10	GWE High Capacity Filter 10/pk.	15.00 ea.	150.00
ET-GF-25	GWE High Capacity Filter 25/pk.	13.50 ea.	337.50
ET-GF-50	GWE High Capacity Filter 50/pk.	11.95 ea.	597.50

Validated for
67 Metals and
2 Anions

Features:

- True membrane element
- Certification for 67 metals and 2 anions
- Completely inert components and assembly process
- Ready to use
- Individually sealed packaging
- 1/8" NPT threaded ends with stepped hose adapter on inlet side
- .45µm, 1 µm and 5µm elements available

1 AquaPrep Filter

2 AquaPrep-V

3 High-Capacity Polyethersulfone Groundwater Filter

Disposable Bailers

Enviro-Tech Services offers the greatest diversity of bailer products and accessories in today's market. We represent several manufacturers which enables you to order compatible parts for your existing bailer stock.

We represent the following bailer manufacturers, since 1988:

Aqua Bailers

Clear-View

Norwell-Norton

Monoflex, Inc.

Jensen Inert Products

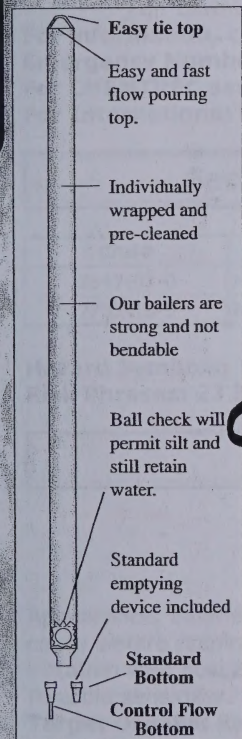
Voss Technologies

Enviro-Tech's Private Label

Disposable Polyethylene

Disposable Teflon

Disposable PVC



Standard Disposable Bailer

Mark

Cat. No.	Width x Length	Description	Brand	Units	Price
Clear PVC Disposable Bailers					
ESP-CV701	.70" x 12"	Clear PVC Bailers; Weighted	Enviro-Tech CV	24/cs.	\$102.00
ESP-CV703	.70" x 36"	Clear PVC Bailers; Weighted	Enviro-Tech CV	24/cs.	128.00
ESP-CV1 53	1.5" x 36"	Clear PVC Bailers; Weighted	Enviro-Tech CV	24/cs.	109.00
Polyethylene Disposable Bailers					
AQ-PY05X36SW	.5" x 36"	Polyethylene Bailers; Weighted	Enviro-Tech AQ	24/cs.	76.80
AQ-PY05X36S	.5" x 36"	Polyethylene Bailers; Unweighted	Enviro-Tech AQ	24/cs.	67.20
AQ-PY75X36SW	.75" x 36"	Polyethylene Bailers; Weighted	Enviro-Tech AQ	24/cs.	93.60
AQ-PY75X36S	.75" x 36"	Polyethylene Bailers; Unweighted	Enviro-Tech AQ	24/cs.	81.60
AQ-PY16X12SW	1.5" x 12"	Polyethylene Bailers; Weighted	Enviro-Tech AQ	24/cs.	93.60
AQ-PY16X12S	1.5" x 12"	Polyethylene Bailers; Unweighted	Enviro-Tech AQ	24/cs.	76.80
AQ-PY16X36SW	1.5" x 36"	Polyethylene Bailers; Weighted	Enviro-Tech AQ	24/cs.	109.44
AQ-PY1 6X36S	1.5" x 36"	Polyethylene Bailers; Unweighted	Enviro-Tech AQ	24/cs.	81.60
VOS-91946-SW-ET	1.5" x 36"	Polyethylene Bailers; Weighted	Voss	24/cs.	130.80
VOS-91946-S	1.5" x 36"	Polyethylene Bailers; Unweighted	Voss	24/cs.	100.80
VOS-PE3-SW	3" x 36"	Polyethylene Bailers; Weighted	Voss	9/cs.	85.00
VOS-PE3-S	3" x 36"	Polyethylene Bailers; Unweighted	Voss	9/cs.	71.00
PE3-VOC	Various	VOC Sampling Device	Various	24/cs.	20.00
Polyethylene Double-Check Bailers					
AQ-PY16X12DCW	1.5" x 12"	Polyethylene Bailers; Weighted	Enviro-Tech AQ	24/cs.	105.60
AQ-PY1 6X36DCW	1.5" x 36"	Polyethylene Bailers; Weighted	Enviro-Tech AQ	24/cs.	129.60
AQ-PY1 6X48DCW	1.5" x 48"	Polyethylene Bailers; Weighted	Enviro-Tech AQ	24/cs.	146.40
Teflon Disposable Bailers					
AQ-TF05X36SW	.5" x 36"	Teflon Bailers; Weighted	Enviro-Tech AQ	12/cs.	89.00
AQ-TF05X36S	.5" x 36"	Teflon Bailers; Unweighted	Enviro-Tech AQ	12/cs.	79.00
AQ-TF75X36SW	.75" x 36"	Teflon Bailers; Weighted	Enviro-Tech AQ	12/cs.	106.00
AQ-TF75X36S	.75" x 36"	Teflon Bailers; Unweighted	Enviro-Tech AQ	12/cs.	94.00
AQ-TF16X12SW	1.5" x 12"	Teflon Bailers; Weighted	Enviro-Tech AQ	24/cs.	134.00
AQ-TF16X12S	1.5" x 12"	Teflon Bailers; Unweighted	Enviro-Tech AQ	24/cs.	115.00
VOS-SST-12-011-W-ET	1.5" x 12"	Teflon Bailers; Weighted	Voss	12/cs.	145.00
VOS-SST-12-011-ET	1.5" x 12"	Teflon Bailers; Unweighted	Voss	12/cs.	120.00
AQ-TF16X36SW	1.5" x 36"	Teflon Bailers; Weighted	Enviro-Tech AQ	12/cs.	199.00
AQ-TF16X36S	1.5" x 36"	Teflon Bailers; Unweighted	Enviro-Tech AQ	12/cs.	180.00
VOS-SST-36-021-W-ET	1.5" x 36"	Teflon Bailers; Weighted	Enviro-Tech AQ	12/cs.	215.40
VOS-SST-36-021-ET	1.5" x 36"	Teflon Bailers; Unweighted	Enviro-Tech AQ	12/cs.	191.40
VOS-12DT-031	Various	Teflon VOC Sampling Device	Various	12/cs.	24.00

Material Safety Data Sheet

Hydrochloric Acid 6N

ACC# 89586

Section 1 - Chemical Product and Company Identification

MSDS Name: Hydrochloric Acid 6N

Catalog Numbers: NC9655538, NC9727995, SA56, SA56-200, SA561, SA56200, SA564, SA56500, XX43701LI, XXAS437020LI, XXHCL6.0NPD20L, 23011111

Synonyms: Muriatic acid; Chlorohydric acid; Hydrogen chloride; Spirits of salt

Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100

Emergency Number: 201-796-7100

For CHEMTREC assistance, call: 800-424-9300

For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7647-01-0	Hydrogen chloride	51.5	231-595-7
7732-18-5	Water	Balance	231-791-2

Hazard Symbols: T C

Risk Phrases: 23 35

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless to slight yellow. **Danger!** Corrosive. Causes eye and skin burns. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns. Mutagen. May cause fetal effects based upon animal studies. Possible sensitizer. May be harmful if swallowed.

Target Organs: Respiratory system, teeth, eyes, skin, circulatory system.

Potential Health Effects

Eye: May cause irreversible eye injury. Vapor or mist may cause irritation and severe burns. Contact with liquid is corrosive to the eyes and causes severe burns. May cause painful sensitization to light.

Skin: May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Contact with liquid is corrosive and causes severe burns and ulceration.

Ingestion: May cause circulatory system failure. Causes severe digestive tract burns with abdominal pain, vomiting, and possible death. May cause corrosion and permanent tissue destruction of the esophagus and digestive tract. May be harmful if swallowed.

Inhalation: May cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath and delayed lung edema. Causes chemical burns to the respiratory tract. Exposure to the mist and vapor may erode exposed teeth. Causes corrosive action on the mucous membranes.

Chronic: Prolonged or repeated skin contact may cause dermatitis. Repeated exposure may cause erosion of teeth. May cause fetal effects. Laboratory experiments have resulted in mutagenic effects. Prolonged exposure may cause conjunctivitis, photosensitization, and possible blindness.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes). **SPEEDY ACTION IS CRITICAL!**

Skin: Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.

Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Give milk of magnesia.

Inhalation: Get medical aid immediately. Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

Notes to Physician: Do NOT use sodium bicarbonate in an attempt to neutralize the acid.

Antidote: Do NOT use oils or ointments in eye.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Not flammable, but reacts with most metals to form flammable hydrogen gas. Use water spray to keep fire-exposed containers cool. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Reaction with water may generate much heat which will increase the concentration of fumes in the air. Containers may explode when heated.

Extinguishing Media: For large fires, use water spray, fog, or alcohol-resistant foam. Substance is nonflammable; use agent most appropriate to extinguish surrounding fire. Do NOT get water inside containers. Do NOT use straight streams of water. Most foams will react with the material and release corrosive/toxic gases. Cool containers with flooding quantities of water until well after fire is out. For small fires, use carbon dioxide (except for cyanides), dry chemical, dry sand, and alcohol-resistant foam.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Large spills may be neutralized with dilute alkaline solutions of soda ash, or lime. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Provide

ventilation. Do not get water inside containers. A vapor suppressing foam may be used to reduce vapors. Cover with dry earth, dry sand, or other non-combustible material followed with plastic sheet to minimize spreading and contact with water.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Contents may develop pressure upon prolonged storage. Do not breathe dust, vapor, mist, or gas. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Do not ingest or inhale. Discard contaminated shoes. Use caution when opening. Keep from contact with moist air and steam.

Storage: Do not store in direct sunlight. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Corrosives area. Do not store in metal containers. Do not store near flammable or oxidizing substances (especially nitric acid or chlorates).

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Hydrogen chloride	C 5 ppm	50 ppm IDLH	C 5 ppm; C 7 mg/m ³
Water	none listed	none listed	none listed

OSHA Vacated PELs: Hydrogen chloride: C 5 ppm; C 7 mg/m³ Water: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear neoprene or polyvinyl chloride gloves to prevent exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid

Appearance: colorless to slight yellow

Odor: strong, pungent

pH: 0.01

Vapor Pressure: 5.7 mm Hg @ 0 deg C

Vapor Density: 1.26

Evaporation Rate: > 1.00 (N-butyl acetate)

Viscosity: Not available.

Boiling Point: 81.5-110 deg C @ 760 mmHg

Freezing/Melting Point: -74 deg C
Autoignition Temperature: Not applicable.
Flash Point: Not applicable.
Decomposition Temperature: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Reactivity: 0
Explosion Limits, Lower: Not available.
Upper: Not available.
Solubility: Miscible.
Specific Gravity/Density: 1.0-1.2
Molecular Formula: HCl.H₂O
Molecular Weight: 36.46

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Mechanical shock, incompatible materials, metals, excess heat, exposure to moist air or water, bases.

Incompatibilities with Other Materials: Bases, acetic anhydride, alkali metals, aluminum, amines, copper, copper alloys, fluorine, iron, sodium hydroxide, steel, sulfuric acid, vinyl acetate, zinc, potassium permanganate, cesium acetylene carbide, rubidium acetylene carbide, rubidium carbide, sodium, chlorosulfonic acid, oleum, carbonates, perchloric acid, calcium phosphide, metal oxides, acetates, cesium carbide, beta-propiolactone, ethyleneimine, propylene oxide, lithium silicides, alcohols + hydrogen cyanide, 2-aminoethanol, ammonium hydroxide, calcium carbide, 1,1-difluoroethylene, ethylene diamine, magnesium boride, mercuric sulfate, silver perchlorate + carbon tetrachloride, uranium phosphide.

Hazardous Decomposition Products: Hydrogen chloride, chlorine, carbon monoxide, carbon dioxide, hydrogen gas.

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:

CAS# 7647-01-0: MW4025000

CAS# 7732-18-5: ZC0110000

LD50/LC50:

CAS# 7647-01-0:

Inhalation, mouse: LC50 = 1108 ppm/1H;

Inhalation, rat: LC50 = 3124 ppm/1H;

Oral, rabbit: LD50 = 900 mg/kg;

CAS# 7732-18-5:

Oral, rat: LD50 = >90 mL/kg;

Carcinogenicity:

CAS# 7647-01-0:

IARC: Group 3 carcinogen **CAS#** 7732-18-5: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Epidemiology: Experimental reproductive effects have been reported.

Teratogenicity: Embryo or Fetus: Stunted fetus, Inhalation, rat TCL0=450 mg/m³/1H Specific Developmental Abnormalities: homeostatis, Inhalation, rat TCL0=450 mg/m³/1H (female 1 days pre-mating).

Reproductive Effects: No information available.

Neurotoxicity: No information available.

Mutagenicity: Cytogenetic analysis: Hamster, lung = 30 mmol/L.; Cytogenetic analysis: Hamster, ovary = 8 mmol/L.

Other Studies: No data available.

Section 12 - Ecological Information

Ecotoxicity: Fish: Bluegill/Sunfish: 3.6 mg/L; 48Hr; Lethal (unspecified) Bluegill/Sunfish: LC50; 96 Hr; pH 3.0-3.5 No data available.

Environmental: Rapidly hydrolyzes when exposed to water. Will exhibit extensive evaporation from soil surfaces. Upon transport through the soil, hydrochloric acid will dissolve some of the soil materials (especially those with carbonate bases) and the acid will neutralize to some degree.

Physical: No information available.

Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	HYDROCHLORIC ACID				HYDROCHLORIC ACID SOLUTION
Hazard Class:	8				8(9.2)
UN Number:	UN1789				UN1789
Packing Group:	II				II

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 7647-01-0 is listed on the TSCA inventory.

CAS# 7732-18-5 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

CAS# 7647-01-0: final RQ = 5000 pounds (2270 kg)

Section 302 (TPQ)

CAS# 7647-01-0: TPQ = 500 pounds; RQ = 5000 pounds (does not meet toxicity criteria but because of high production volume and recognized toxicity is considered a chemical of concern)

SARA Codes

CAS # 7647-01-0: acute.

Section 313

This material contains Hydrogen chloride (CAS# 7647-01-0, 51.5%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 7647-01-0 is listed as a hazardous air pollutant (HAP). This material does not contain any Class 1 Ozone depleters. This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

CAS# 7647-01-0 is listed as a Hazardous Substance under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

CAS# 7647-01-0 is considered highly hazardous by OSHA.

STATE

CAS# 7647-01-0 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T C

Risk Phrases:

R 23 Toxic by inhalation.

R 35 Causes severe burns.

Safety Phrases:

S 1/2 Keep locked up and out of reach of children.

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 9 Keep container in a well-ventilated place.

WGK (Water Danger/Protection)

CAS# 7647-01-0: 1

CAS# 7732-18-5: No information available.

Canada

CAS# 7647-01-0 is listed on Canada's DSL List. CAS# 7647-01-0 is listed on Canada's DSL List.

CAS# 7732-18-5 is listed on Canada's DSL List. CAS# 7732-18-5 is listed on Canada's DSL List.

This product has a WHMIS classification of E, D2A.

CAS# 7647-01-0 is listed on Canada's Ingredient Disclosure List.

CAS# 7732-18-5 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 7647-01-0: OEL-AUSTRALIA:TWA 5 ppm (7 mg/m3) OEL-AUSTRIA:TWA 5 ppm (7 mg/m3) OEL-BELGIUM:STEL 5 ppm (7.7 mg/m3) OEL-DENMARK:STEL 5 ppm (7 mg/m3) OEL-FINLAND:STEL 5 ppm (7 mg/m3);Skin OEL-FRANCE:STEL 5 ppm (7.5 mg/m3) OEL-GERMANY:TWA 5 ppm (7 mg/m3) OEL-HUNGARY:STEL 5 mg/m3 OEL-JAPAN:STEL 5 ppm (7.5 mg/m3) OEL-THE NETHERLANDS:TWA 5 ppm (7 mg/m3) OEL-THE PHILIPPINES:TWA 5 ppm (7 mg/m3) OEL-POLAND:TWA 5 mg/m3 OEL-RUSSIA:STEL 5 ppm (5 mg/m3) OEL-SWEDEN:STEL 5 ppm (8 mg/m3) OEL-SWITZERLAND:TWA 5 ppm (7.5 mg/m3);STEL 10 ppm (15 mg/m3) OEL-THAILAND:TWA 5 ppm (7 mg/m3) OEL-TURKEY:TWA 5 ppm (7 mg/m3) OEL-UNITED KINGDOM:TWA 5 ppm (7 mg/m3);STEL 5 ppm (7 mg/m3) OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 7/06/1999

Revision #4 Date: 8/02/2000

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Warning: Serious! Caution! Corrosive. May cause severe eye irritation with contact.

Target Organ: Skin, Eyes

Personal Health Effects

Eye: Causes pain, conjunctivitis, tearing, redness, blurred vision, severe burns, necrosis of deep tissues with permanent damage and blindness.

Skin: Skin may turn brown yellow. Deep burns are deep to heal and scarring may occur.

Inhalation: Causes pain in mouth, throat, at which followed by vomiting, bloody diarrhea,

hyperventilation, rigors, dizziness, weakness, loss of consciousness, asphyxiation, pulmonary

edema, severe fluid in lungs, chest pain, difficulty with breathing and perfusion.

Inhalation may cause coughing, diarrhea, weakness, dry throat/chest, chest pain, dyspnea,

hoarse voice, hyperemia, cyanosis, pneumonia, pain, pain, chest pain.

Choking, hemoptysis, copious sputum, dental erosion, low mucous, chronic cough, bronchitis,

chemical pneumonia, partial airway obstruction.

Section 4 - First Aid Measures

Material Safety Data Sheet

Nitric acid solutions, , 0.4% - 50% v/v, 0.1N-6.0N

ACC# 75240

Section 1 - Chemical Product and Company Identification

MSDS Name: Nitric acid solutions, , 0.4% - 50% v/v, 0.1N-6.0N**Catalog Numbers:** LC17750, LC17770, LC17800, LC17840, LC17850, LC17870**Synonyms:****Company Identification:**

Labchem Inc.

200 William Pitt Way

Pittsburgh, PA 15238

For information, call: 412-826-5230**For CHEMTREC assistance, call:** 800-424-9300**For International CHEMTREC assistance, call:** 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7697-37-2	Nitric acid	0.04-50	231-714-2
7732-18-5	Water	balance	231-791-2

Hazard Symbols: None listed.**Risk Phrases:** None listed.

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless. **Caution!** Corrosive. May cause severe eye and skin irritation with possible burns.

Target Organs: None known.

Potential Health Effects

Eye: Causes pain, photophobia, tearing, edema, corneal ulceration, severe burns, necrosis of deep tissue with permanent damage and blindness.

Skin: Skin may turn brown-yellow. Deep burns are slow to heal and scarring may occur.

Ingestion: Causes pain in mouth, throat, stomach followed by vomiting, bloody diarrhea, hypotension, oliguria, anuria, possible fatal circulatory collapse, asphyxia from glottal edema. Perforation burns of gastrointestinal tract possible with fever and peritonitis.

Inhalation: May cause coughing, dizziness, weakness, dry throat/chest, chest pain, dyspnea, frothy sputum, hypotension, cyanosis, pneumonitis, fatal pulmonary edema.

Chronic: Dermatitis, conjunctivitis, dental erosion, jaw necrosis, chronic cough, bronchitis, chemical pneumonitis, gastrointestinal disturbances.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids until no evidence of chemical remains. Get medical aid at once. Cover burns with loose sterile non-medicated bandages.

Skin: Get medical aid. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Remove contaminated clothing and shoes. Cover burns with a dry sterile bandage (secure, not tight).

Ingestion: Get medical aid at once. Give 1 ounce of milk of magnesia. Give conscious victim large quantities of water to dilute acid. Give oxygen if respiration is depressed.

Inhalation: Give artificial respiration if necessary. Get medical aid. Keep victim warm, at rest. Move victim to fresh air. Maintain airway and blood pressure.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Firefighting Measures

General Information: Move container if possible, cool with flooding amounts of water. Avoid breathing corrosive vapors. Negligible fire and explosion hazard for solutions <5%. At higher concentration, increased flammability of combustibles, readily oxidizable materials. Severe explosion hazard by reaction with incombustibles (metallic rs, carbides, hydrogen sulfide, turpentine). In or near fire material emits toxic and reactive nitrogen oxides of gases.

Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with an alkaline material such as soda ash or lime. Keep out of sewers/drains. Ventilate and wear protective clothing. Scoop material into suitable (plastic or glass) container, label for disposal as "corrosive".

Section 7 - Handling and Storage

Handling: Avoid breathing dust, vapor, mist, or gas. Avoid contact with eyes, skin, and clothing. Handle as corrosive liquid, dispense with care; wear protective clothing, gloves, goggles.

Storage: Store at room temperature. Store in glass or approved plastic containers only, keep capped. Protect from heat and incompatibles.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Local exhaust ventilation may be necessary to control any air contaminants to within their TLVs during the use of this product.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Nitric acid	2 ppm; 4 ppm STEL	2 ppm TWA; 5 mg/m ³ TWA 25 ppm IDLH	2 ppm TWA; 5 mg/m ³ TWA

Water

none listed

none listed

none listed

OSHA Vacated PELs: Nitric acid: 2 ppm TWA; 5 mg/m³ TWA Water: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Do not wear contact lenses when working with chemicals. An eye wash fountain should be available in the immediate work area. Wear gloves, splash proof goggles and faceshield.

Skin: Wear impervious gloves (viton, saranex).

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: PEL to 50ppm - SAF/SCBAF/SAF:PD,PP,CF. m - SCBAF:PD,PP. ighting - SCBAF:PD,PP. NOTE: DO NOT USE OXIDIZABLE SORBENTS IN RESPIRATORS.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid

Appearance: colorless

Odor: acrid odor

pH: acidic

Vapor Pressure: 14 mm Hg @25c

Vapor Density: 0.7 - 2.2

Evaporation Rate:>1 (ether=1)

Viscosity: Not available.

Boiling Point: 181-212 deg F

Freezing/Melting Point:-44 - 32 deg F

Decomposition Temperature:Not available.

Autoignition Temperature: Not available.

Flash Point: Not available.

NFPA Rating: Not published.

Explosion Limits, Lower:Not available.

Upper: Not available.

Solubility: Soluble.

Specific Gravity/Density:1.0-1.5

Molecular Formula:Not available.

Molecular Weight:Not available.

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures up to boiling point. Nitric oxides quietly evolved - sunlight catalyses oxide formation (yellow color, aging).

Conditions to Avoid: Incompatible materials, easily oxidized materials.

Incompatibilities with Other Materials: Metals, acetic acid, acetic anhydride, acrylonitrile, alcohols, anhydrides, fluorine, organic acids, perchlorates, aldehydes (e.g. acetaldehyde, acrolein, chloral hydrate, formaldehyde), ketones (e.g. acetone, acetophenone, MEK, MIBK), metals as powders (e.g. hafnium, raney nickel), organics, carbides, acetonitrile, acetone, arsine, phosphides, dioxides, thiocyanates, inorganic acids, chlorine, cyclic compounds, halides.

Hazardous Decomposition Products: Nitrogen oxides, nitric acid vapors, catalyzed by sunlight.

Hazardous Polymerization: Has not been reported

Section 11 - Toxicological Information

RTECS#:**CAS#** 7697-37-2 unlisted.**CAS#** 7732-18-5 unlisted.**LD50/LC50:****CAS#** 7697-37-2:Inhalation, rat: LC50 = 67 ppm(NO₂)/4H;**CAS#** 7732-18-5:

Oral, rat: LD50 = >90 mL/kg;

Carcinogenicity:

CAS# 7697-37-2: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA. CAS# 7732-18-5: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Epidemiology: Severe eye, mucous membrane, and skin irritant.**Teratogenicity:** No data available.**Reproductive Effects:** No data available.**Neurotoxicity:** No data available.**Mutagenicity:** No data available.**Other Studies:** No data available.

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.**RCRA U-Series:** None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	NITRIC ACID, NOT MORE THAN 70%				No information available.
Hazard Class:	8				
UN Number:	UN2031				
Packing Group:	PG II				

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 7697-37-2 is listed on the TSCA inventory.

CAS# 7732-18-5 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

CAS# 7697-37-2: final RQ = 1000 pounds (454 kg)

Section 302 (TPQ)

CAS# 7697-37-2: TPQ = 1000 pounds; RQ = 1000 pounds

SARA Codes

CAS # 7697-37-2: acute, chronic, flammable.

Section 313

This chemical is not at a high enough concentration to be reportable under Section 313. No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depleters. This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

CAS# 7697-37-2 is listed as a Hazardous Substance under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

CAS# 7697-37-2 is considered highly hazardous by OSHA.

STATE

CAS# 7697-37-2 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

Not available.

Risk Phrases:

Safety Phrases:

WGK (Water Danger/Protection)

CAS# 7697-37-2: 1

CAS# 7732-18-5: No information available.

Canada

CAS# 7697-37-2 is listed on Canada's DSL List. CAS# 7697-37-2 is listed on Canada's DSL List.

CAS# 7732-18-5 is listed on Canada's DSL List. CAS# 7732-18-5 is listed on Canada's DSL List.

WHMIS: Not available.

CAS# 7697-37-2 is listed on Canada's Ingredient Disclosure List.

CAS# 7732-18-5 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 7697-37-2: OEL-ARAB Republic of Egypt:TWA 2 ppm (5 mg/m3) OEL-

AUSTRALIA:TWA 2 ppm (5 mg/m³);STEL 4 ppm (10 mg/m³) OEL-BELGIUM:TWA 2 ppm (5.2 mg/m³);STEL 4 ppm (10 mg/m³) OEL-CZECHOSLOVAKIA:TWA 2.5 mg/m³;STEL 5 mg/m³ OEL-DENMARK:TWA 2 ppm (5 mg/m³) OEL-FINLAND:TWA 2 ppm (5 mg/m³);STEL 5 ppm (13 mg/m³);Skin OEL-FRANCE:TWA 2 ppm (5 mg/m³);STEL 4 ppm (10 mg/m³) OEL-GERMANY:TWA 10 ppm (25 mg/m³) OEL-HUNGARY:STEL 5 mg/m³ OEL-JAPAN:TWA 2 ppm (5.2 mg/m³) OEL-THE PHILIPPINES:TWA 2 ppm (5 mg/m³) OEL-POLAND:TWA 10 mg/m³ OEL-RUSSIA:TWA 2 ppm;STEL 2 mg/m³;Skin OEL-SWEDEN:TWA 2 ppm (5 mg/m³);STEL 5 ppm (13 mg/m³) OEL-SWITZERLAND:TWA 2 ppm (5 mg/m³);STEL 4 ppm (1 mg/m³) OEL-THAILAND:TWA 2 ppm (5 mg/m³) OEL-TURKEY:TWA 2 ppm (5 mg/m³) OEL-UNITED KINGDOM:TWA 2 ppm (5 mg/m³);STEL 4 ppm (10 mg/m³) OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 11/17/1997

Revision #1 Date: 12/06/2000

Information in this MSDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc. assumes no liability resulting from the use of this MSDS. The user must determine suitability of this information for his application.

Material Safety Data Sheet

Sulfuric Acid Solutions 5-93%, Sulfuric Acid Solutions 0.02N - 12N

ACC# 75140

Section 1 - Chemical Product and Company Identification

MSDS Name: Sulfuric Acid Solutions 5-93%, Sulfuric Acid Solutions 0.02N - 12N

Catalog Numbers: 2340538, FLC2574, LC25570, LC25580, LC25590, LC25600, LC25620, LC25640, LC25650, LC25660, LC25670, LC25680, LC25700, LC25720, LC25730, LC25740, LC25770, LC25790, LC25800, LC25830, LC25840, LC25850, LC25870, LC25880, LC40741

Synonyms: None

Company Identification:

Labchem Inc.
200 William Pitt Way
Pittsburgh, PA 15238

For information, call: 412-826-5230

For CHEMTREC assistance, call: 800-424-9300

For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7664-93-9	Sulfuric acid	0.05-80	231-639-5
7732-18-5	Water	balance	231-791-2

Hazard Symbols: None listed.

Risk Phrases: None listed.

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless. **Danger!** Corrosive. Causes eye and skin burns. Causes digestive and respiratory tract burns.

Target Organs: None.

Potential Health Effects

Eye: Causes severe eye burns. Eye contact can result in blindness; exposure to mist leads to watering, irritation.

Skin: Skin contact may result in severe burns, blistering, pain.

Ingestion: May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. Vomiting and diarrhea of dark blood may occur; asphyxia from throat swelling. Stomach and esophagus may become perforated.

Inhalation: May cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath and delayed lung edema. Causes chemical burns to the respiratory tract. At 5mg/M3 concentrations, nose and throat irritation occurs, with headache, cough, increased respiratory rate, impairment of lung to ventilate.

Chronic: Delayed symptoms include tight chest, fluid in lungs, cyanosis (blue), hypotension,

bronchitis or emphysema. tracheobronchitis, dental erosion/discoloration, pneumonia, gastrointestinal disturbances may occur. Skin irritation/dermatitis, conjunctivitis and lacrimation of the eye can occur.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids until chemical is gone. Get medical aid at once.

Skin: Get medical aid at once. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion: Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Get medical aid at once. Give one ounce (30ml) of milk of magnesia. Give conscious victim large quantities of water to dilute acid.

Inhalation: Get medical aid at once. Move victim to fresh air immediately. Give artificial respiration if necessary. If breathing is difficult, give oxygen.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Firefighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Contact with metals may evolve flammable hydrogen gas. Avoid breathing toxic and corrosive vapors - keep upwind.

Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: May be neutralized with slaked lime, limestone, or sodium bicarbonate to a pH 7. Place in labeled plastic containers for disposal, wash area down with water.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Use with adequate ventilation.

Storage: Do not store near alkaline substances. Store in labeled non-reactive containers (glass, plastic) protected from heat and incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
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Sulfuric acid	1 mg/m3; 3 mg/m3 STEL	1 mg/m3 TWA 15 mg/m3 IDLH	1 mg/m3 TWA
Water	none listed	none listed	none listed

OSHA Vacated PELs: Sulfuric acid: 1 mg/m3 TWA Water: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133. Provide an eye-wash fountain in the immediate work area. Do not wear contact lenses when working with chemicals.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear acid protective clothing and gloves.

Respirators: 50mg/M3 -GMAGHIEP/HIEPF/SAF/SCBAF. /M3 - SAF:PD,PP,CF. e - GMAGHIEP/SCBA. Firefighting - SCBAF:PD,PP. irator Codes: DHEW (NIOSH) Publication No. 78-210)

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: colorless

Odor: odorless

pH: Not available.

Vapor Pressure: Not available.

Vapor Density: Not available.

Evaporation Rate:

Viscosity: Not available.

Boiling Point: Not available.

Freezing/Melting Point:Not available.

Decomposition Temperature:Not available.

Autoignition Temperature: Not available.

Flash Point: Not available.

NFPA Rating: Not published.

Explosion Limits, Lower:Not available.

Upper: Not available.

Solubility: Soluble.

Specific Gravity/Density:1.0 - 1.7

Molecular Formula:Not available.

Molecular Weight:Not available.

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Incompatible materials, excess heat, combustible materials, organic materials, oxidizers, amines, bases.

Incompatibilities with Other Materials: Explosive or violent reactions with acetone cyanohydrin, acetone and nitric acid orpotassium dichromate, acrylonitrile, alcohols, hydrogen peroxide, allyl chloride, bromates and metals, bromine pentafluoride, carbides, all chlorates, chlorine trifluoride, cuprous nitride, ethylene cyanohydrin, fulminates, indane and nitric acid, iron, mercuric nitride, nitric acid and glycerides, p-nitrotoluene, pentasilver trihydroxydiaminophosphate, perchlorates, phosphorus isocyanate picrates, sliver permanganate, sodium, sodium carbonate, toluene and nitric acid. Dangerous temperatures and pressures occur

with other substances, especially organic combinations. Explosive hydrogen gas is evolved from contact with steel, other metals.

Hazardous Decomposition Products: Oxides of sulfur, hydrogen gas.

Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:

CAS# 7664-93-9 unlisted.

CAS# 7732-18-5 unlisted.

LD50/LC50:

CAS# 7664-93-9:

Inhalation, mouse: LC50 = 320 mg/m³/2H;

Inhalation, rat: LC50 = 510 mg/m³/2H;

Oral, rat: LD50 = 2140 mg/kg;

CAS# 7732-18-5:

Oral, rat: LD50 = >90 mL/kg;

Carcinogenicity:

CAS# 7664-93-9:

ACGIH: A2 - Suspected Human Carcinogen (contained in strong inorganic acid mists)

OSHA: Select carcinogen

IARC: Group 1 carcinogen **CAS#** 7732-18-5: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Epidemiology: No data available.

Teratogenicity: No data available.

Reproductive Effects: No data available.

Neurotoxicity: No data available.

Mutagenicity: No data available.

Other Studies: No data available.

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series: None listed.

Section 14 - Transport Information

US DOT	IATA	RID/ADR	IMO	Canada TDG
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Shipping Name:	SULFURIC ACID
Hazard Class:	8
UN Number:	UN2796
Packing Group:	PG II

No information available.

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 7664-93-9 is listed on the TSCA inventory.

CAS# 7732-18-5 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

CAS# 7664-93-9: final RQ = 1000 pounds (454 kg)

Section 302 (TPQ)

CAS# 7664-93-9: TPQ = 1000 pounds; RQ = 1000 pounds

SARA Codes

CAS # 7664-93-9: acute, chronic, reactive.

Section 313

This chemical is not at a high enough concentration to be reportable under Section 313. No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depleters. This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

CAS# 7664-93-9 is listed as a Hazardous Substance under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 7664-93-9 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

Not available.

Risk Phrases:

Safety Phrases:

WGK (Water Danger/Protection)

CAS# 7664-93-9: 2

CAS# 7732-18-5: No information available.

Canada

CAS# 7664-93-9 is listed on Canada's DSL List. CAS# 7664-93-9 is listed on Canada's DSL List.

CAS# 7732-18-5 is listed on Canada's DSL List. CAS# 7732-18-5 is listed on Canada's DSL List.

WHMIS: Not available.

CAS# 7664-93-9 is listed on Canada's Ingredient Disclosure List.

CAS# 7732-18-5 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 7664-93-9: OEL-ARAB Republic of Egypt:TWA 1 mg/m3 OEL-AUSTRALIA:TWA 1 mg/m3 OEL-BELGIUM:TWA 1 mg/m3;STEL 3 mg/m3 OEL-CZECHOSLOVAKIA:TWA 1 mg/m3;STEL 2 mg/m3 OEL-DENMARK:TWA 1 mg/m3 OEL-FINLAND:TWA 1 mg/m3;STEL 3 mg/m3;Skin OEL-FRANCE:TWA 1 mg/m3;STEL 3 mg/m3 OEL-GERMANY:TWA 1 mg/m3 OEL-HUNGARY:STEL 1 mg/m3 OEL-JAPAN:TWA 1 mg/m3 OEL-THE NETHERLANDS:TWA 1 mg/m3 OEL-THE PHILIPPINES:TWA 1 mg/m3 OEL-POLAND:TWA 1 mg/m3 OEL-RUSSIA:STEL 1 mg/m3;Skin OEL-SWEDEN:TWA 1 mg/m3;STEL 3 mg/m3 OEL-SWITZERLAND:TWA 1 mg/m3;STEL 2 mg/m3 OEL-THAILAND:TWA 1 mg/m3 OEL-TURKEY:TWA 1 mg/m3 OEL-UNITED KINGDOM:TWA 1 mg/m3 OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 11/09/1997

Revision #1 Date: 12/06/2000

Information in this MSDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc. assumes no liability resulting from the use of this MSDS. The user must determine suitability of this information for his application.

Material Safety Data Sheet

Sodium Hydroxide Solutions, 40 to 50%

ACC# 40174

Section 1 - Chemical Product and Company Identification

MSDS Name: Sodium Hydroxide Solutions, 40 to 50%

Catalog Numbers: GENSS2544, NC9687543, RP25443F, SS254-1, SS254-20, SS254-200, SS254-4, SS254-500, SS254200LC, SS25420LC, SS2544LC, SS410-20, SS410-4, SS411-10, SS411-4

Synonyms: Caustic soda; Lye.

Company Identification:

Fisher Scientific

1 Reagent Lane

Fair Lawn, NJ 07410

For information, call: 201-796-7100

Emergency Number: 201-796-7100

For CHEMTREC assistance, call: 800-424-9300

For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
1310-73-2	Sodium hydroxide	40-50	215-185-5
7732-18-5	Water	50-60	231-791-2

Hazard Symbols: C

Risk Phrases: 35

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear. **Danger!** Corrosive. Causes eye and skin burns. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns.

Target Organs: Eyes, skin, mucous membranes.

Potential Health Effects

Eye: Causes eye burns. May cause chemical conjunctivitis and corneal damage.

Skin: Causes skin burns. May cause deep, penetrating ulcers of the skin. May cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color.

Ingestion: May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. May cause perforation of the digestive tract. Causes severe pain, nausea, vomiting, diarrhea, and shock. May cause systemic effects.

Inhalation: Irritation may lead to chemical pneumonitis and pulmonary edema. Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma. Causes chemical burns to the respiratory tract. Aspiration may lead to pulmonary edema. May cause systemic effects.

Chronic: Prolonged or repeated skin contact may cause dermatitis. Effects may be delayed.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid immediately.

Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.

Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Use water with caution and in flooding amounts. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. Non-combustible, substance itself does not burn but may decompose upon heating to produce irritating, corrosive and/or toxic fumes.

Extinguishing Media: Do NOT get water inside containers. For small fires, use dry chemical, carbon dioxide, or water spray. For large fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray. Cool containers with flooding quantities of water until well after fire is out.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Discard contaminated shoes. Use only with adequate ventilation. Do not breathe spray or mist.

Storage: Keep container closed when not in use. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from strong acids. Keep away from metals. Keep away from flammable liquids. Keep away from organic halogens.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Sodium hydroxide	C 2 mg/m3	10 mg/m3 IDLH	2 mg/m3 TWA
Water	none listed	none listed	none listed

OSHA Vacated PELs: Sodium hydroxide: C 2 mg/m3 Water: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear chemical goggles.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: clear

Odor: none reported

pH: Alkaline

Vapor Pressure: 14 mm Hg

Vapor Density: >1.0

Evaporation Rate: Not available.

Viscosity: >1 (ether=1)

Boiling Point: > 100 deg C

Freezing/Melting Point: > 0 deg C

Autoignition Temperature: Not applicable.

Flash Point: Not applicable.

Decomposition Temperature: Not available.

NFPA Rating: (estimated) Health: 3; Flammability: 0; Reactivity: 1

Explosion Limits, Lower: Not available.

Upper: Not available.

Solubility: Soluble.

Specific Gravity/Density: >1.000

Molecular Formula: Solution

Molecular Weight: Not available.

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions.

Conditions to Avoid: Extreme temperatures.

Incompatibilities with Other Materials: Metals, acids, aluminum, tin, zinc, flammable liquids, nitromethane, nitro compounds, halogenated organics (e.g. dibromoethane, hexachlorobenzene, methyl chloride, trichloroethylene).

Hazardous Decomposition Products: Toxic fumes of sodium oxide.

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:

CAS# 1310-73-2: WB4900000

CAS# 7732-18-5: ZC0110000

LD50/LC50:

CAS# 1310-73-2:

Draize test, rabbit, eye: 400 ug Mild;

Draize test, rabbit, eye: 1% Severe;

Draize test, rabbit, eye: 50 ug/24H Severe;

Draize test, rabbit, eye: 1 mg/24H Severe;

Draize test, rabbit, skin: 500 mg/24H Severe;

CAS# 7732-18-5:

Oral, rat: LD50 = >90 mL/kg;

Carcinogenicity:

CAS# 1310-73-2: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA. **CAS#** 7732-18-5: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Epidemiology: No information found.

Teratogenicity: No information found.

Reproductive Effects: No information found.

Neurotoxicity: No information found.

Mutagenicity: No information found.

Other Studies: See actual entry in RTECS for complete information.

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	SODIUM HYDROXIDE,SOLUTION				SODIUM HYDROXIDE SOLUTION
Hazard Class:	8				8(9.2)

UN Number:	UN1824
Packing Group:	II

UN1824
II

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 1310-73-2 is listed on the TSCA inventory.

CAS# 7732-18-5 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

CAS# 1310-73-2: final RQ = 1000 pounds (454 kg)

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 1310-73-2: acute, reactive.

Section 313

No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depleters. This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

CAS# 1310-73-2 is listed as a Hazardous Substance under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 1310-73-2 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

C

Risk Phrases:

R 35 Causes severe burns.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 37/39 Wear suitable gloves and eye/face

protection.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 1310-73-2: 1

CAS# 7732-18-5: No information available.

Canada

CAS# 1310-73-2 is listed on Canada's DSL List. CAS# 1310-73-2 is listed on Canada's DSL List.

CAS# 7732-18-5 is listed on Canada's DSL List. CAS# 7732-18-5 is listed on Canada's DSL List.

This product has a WHMIS classification of E.

CAS# 1310-73-2 is listed on Canada's Ingredient Disclosure List.

CAS# 7732-18-5 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 1310-73-2: OEL-AUSTRALIA:TWA 2 mg/m³ OEL-BELGIUM:STEL 2 mg/m³

OEL-DENMARK:TWA 2 mg/m³ OEL-FINLAND:TWA 2 mg/m³ OEL-FRANCE:TWA 2 mg

/m³ OEL-GERMANY:TWA 2 mg/m³ OEL-JAPAN:STEL 2 mg/m³ OEL-THE NETHERLA

NDS:TWA 2 mg/m³ OEL-THE PHILIPPINES:TWA 2 mg/m³ OEL-SWEDEN:TWA 2 mg/

m³ OEL-SWITZERLAND:TWA 2 mg/m³;STEL 4 mg/m³ OEL-THAILAND:TWA 2 mg/m³

OEL-TURKEY:TWA 2 mg/m³ OEL-UNITED KINGDOM:TWA 2 mg/m³;STEL 2 mg/m³

OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW

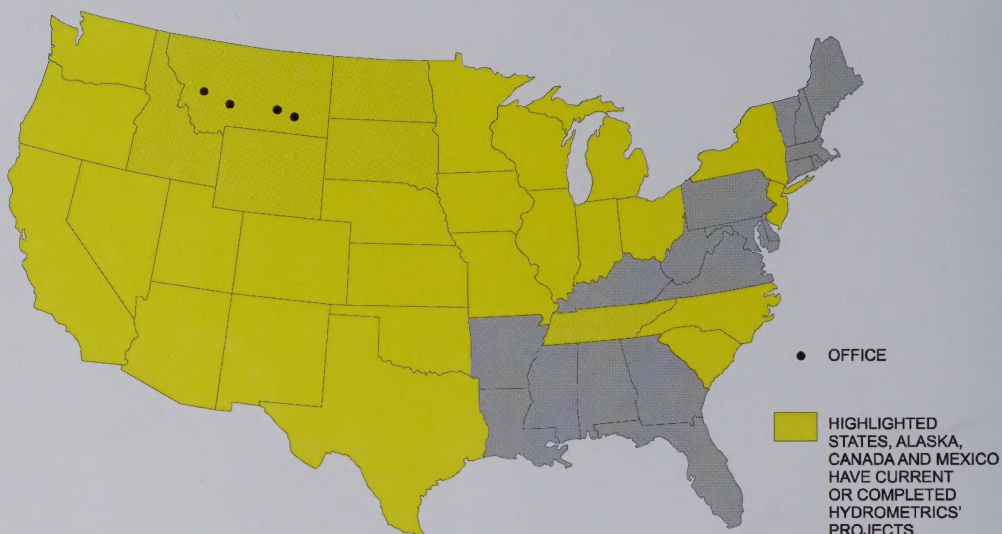
ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 1/27/1999

Revision #6 Date: 11/12/2001

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.



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